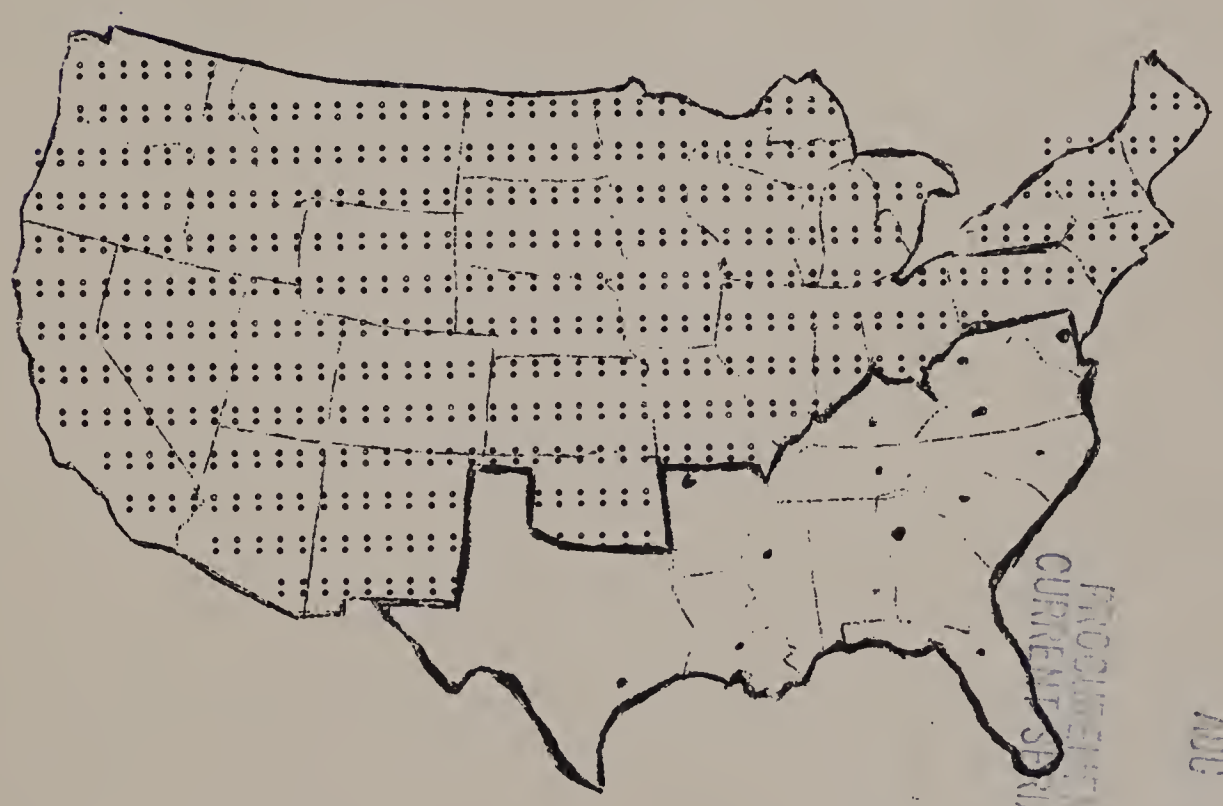
U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL HUSBANDRY RESEARCH DIVISION
AND
COOPERATING SOUTHERN STATES
S-10

Improvement of Beef Cattle Through Breeding Methods

1958 Annual Report
and
Proceedings S-10 Technical Committee Meeting
Tifton, Georgia
August 30 - September 3, 1959



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This is a report of project leaders and the Regional Coordinator covering research projects not yet completed. It is intended for the use of administrative leaders and workers in this or related fields of research. The material is not intended for general distribution and should not be quoted in publications.

C O N T E N T S

PERSONNEL OF THE S-10 PROJECT

STATE AGRICULTRUAL EXPERIMENT STATION WORKERS
(asterisk indicates Technical Committee Members for 1959)

Alabama	*T. B. Patterson, W. M. Warren	Auburn, Ala.
Arkansas	*Warren Gifford, C. J. Brown	Fayetteville, Ark.
Florida	*Marvin Koger, A. C. Warnick	Gainesville, Fla.
	W. G. Kirk	Ona, Fla.
Georgia	*B. L. Southwell, W. C. McCormick	Tifton, Ga.
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Kentucky	*Neil Bradley	Lexington, Ky.
Louisiana	*R. S. Temple	Baton Rouge, La.
	T. M. DeRouen	Jeanerette, La.
Maryland	*W. W. Green, J. E. Foster	College Park, Md.
Mississippi	*C. E. Lindley, J. C. Taylor, J. C. Dollahon, Bryan Baker	State College, Miss.
	B. G. Ruffin	Prairie, Miss.
North Carolina	*J. H. Gregory, E. U. Dillard, E. R. Barrick, J. E. Legates, D. G. Spruill	Raleigh, N. C.
South Carolina	*W. C. Godley, E. G. Godbey	Clemson, S. C.
Tennessee	*C. S. Hobbs, H. J. Smith, J. W. High, J. W. Cole, L. E. Orme, R. J. Cooper, Ralph Dodson	Knoxville, Tenn.
	J. M. Bird, R. A. Reynolds	Oak Ridge, Tenn.
	J. H. Felts	Greeneville, Tenn.
	J. A. Odom	Crossville, Tenn.
	L. M. Safley	Springfield, Tenn.
	E. J. Chapman	Spring Hill, Tenn.
	J. McLaren, J. Bryan, R. Scott	Grand Junction, Tenn.
Texas	Walter E. Kruse	McGregor, Tex.
	*T. C. Cartwright, R. E. Patterson, Sylvia Cover, G. T. King, H. O. Kunkel	College Station, Tex.
	A. A. Melton	Balmorhea, Tex.
	J. P. Smith, George Ellis	Panhandle, Tex.
Virginia	*J. A. Gaines, G. W. Litton, R. C. Carter, T. J. Marlowe, J. S. Copenhaver	Blacksburg, Va.
	K. P. Bovard	Front Royal, Va.
	Roy Hammes	Middleburg, Va.
	William McClure	Steeles Tavern, Va.
West Virginia	*H. E. Kidder, G. C. Anderson	Morgantown, W. Va

U. S. DEPARTMENT OF AGRICULTURE WORKERS

E. J. Warwick, Chief, Cattle Research Section. . . . . Beltsville, Md.
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REGIONAL OFFICERS - 1959

R. E. Patterson, Administrative Advisor . . . . . College Station, Texas
W. W. Green, Chairman. . . . . College Park, Maryland
T. C. Cartwright, Secretary . . . . . McGregor, Texas
Marvin Koger, Executive Committee Member . . . . . Gainesville, Florida

INTRODUCTION

This project was initiated in 1948 to investigate and develop methods of breeding more productive beef cattle for the South. Detailed Annual Reports showing research developments and progress in each state have been prepared in each year since 1950. Earlier reports included material on the overall program, and will not be repeated here. A limited number of earlier reports for some years are available and may be obtained from the Regional Coordinator.

This publication includes the annual report from each of the 14 cooperating states and the proceedings of the 1959 Annual Meeting of the S-10 Technical Committee. The State reports were prepared by station project leaders and personnel as summaries of research developments and progress at each Station during 1958. The results are not considered as final, but the material will aid cooperators and the Coordinator in developing an integrated program. This report also provides information needed by Heads of Animal Husbandry Departments, Experiment Station Directors, and U. S. Department of Agriculture Officials for evaluation of the projects with respect to objectives and procedures. <u>This report is not for general distribution and material in it should not be quoted in publications</u>.

SCOPE OF PROJECT AND RECENT DEVELOPMENTS

Agricultural Experiment Stations in 14 states and the Animal Husbandry Research Division of the Agricultural Research Service, U. S. Department of Agriculture had active contributing projects in the program in 1958. Experimental cattle were maintained at 36 Experiment Stations and sub-stations in the Region. Thirty-three of these were State-owned and three Federally owned. The latter three stations located at Jeanerette, Louisiana, Brooksville, Florida, and Front Royal, Virginia were in each case operated cooperatively with the state in which they were located.

As of July 1, 1959 there were 11,467 head of beef cattle in research herds at stations in the project. This included 5451 cows and heifers over two years of age, 1262 yearling heifers, 3809 calves, 413 bulls, and 532 steers (Table 1). In comparison with the inventory on July 1, 1958 breeding cows and replacement heifers were approximately the same, calves increased by about 200 and steers decreased by about 300 head. Postweaning feeding and/or grazing tests completed during the year included 924 young bulls, 905 heifers, and 798 steers (Table 2). This was 305 more bulls and 179 more steers on feeding tests than in the previous year.

This regional project continues to be a diversified project with respect to types and kinds of cattle in the breeding herds. In all, some 35 different types and kinds of matings were represented in the 1958 calf crop (Table 3). Of these, nine were "inter se" matings within herds belonging to breeds with established record associations or strains derived from crosses among British and Zebu type cattle. The other types of matings were crosses of various kinds among and between three British breeds, Brahman, British-Brahman strains, and Charolaise. British beef

types predominated in the northern part of the region, but in the southern part, particularly in the Gulf Coast area, newer kinds and crosses continued to be tested. The approximate percentage in each main type of mating was as follows: British "inter se" 65%; Brahman and British-Zebu derivatives "inter se" 10%; crosses among British breeds 5%; and other types of crosses 20%.

Emphasis has continued on the development of more precise methods for beef cattle improvement with respect to performance characteristics such as: growth rate, efficiency, cow productivity, adaptation to environmental conditions and quality of meat. The latter characteristic continued to receive increased attention in cooperative investigations which tied together beef cattle breeding and meats research at several institutions. Animals produced in the breeding program provided experimental material of known and often diverse genetic and environmental background for studies of factors influencing beef quality. Research results obtained in some of these investigations are included in the proceedings of the 1959 Annual Meeting.

Pregnancy examinations after the breeding season continue to be a valuable tool at many stations for increasing effective herd size. This procedure helps to avoid wintering cows that will not calve and provides for the production of at least one calf by more potential replacements. Reproductive efficiency continues to be a major problem at many stations.

Studies on Bovine Dwarfism continued at four station in the Region. The major problem in the control of dwarfism, identification of carriers of the dwarf gene, has not been solved. These studies included: X-rays of vertebra, blood constituents, anatomy and physiology and phenotypic expression of the syndorome from observations on animals in which the genotype is presumed to be known.

INTEREST OF PUBLIC IN THE PROJECT

On the farm testing programs for beef cattle continued to increase throughout the Region. It is estimated that some 50,000 breeding cows in about 1,000 herds are in beef cattle improvement programs which utilize techniques developed in this project. Testing stations for the measurement of feed lot performance by young bulls have been started in several states. Many of these testing stations are operated as breeder cooperatives, usually under the supervision of the Agricultural Extension Service in their respective states. Prices paid for young bulls at auction sales from these cooperative tests indicate that cattlemen are paying a premium for those with high performance records and good conformation.

Field days and sales at stations where results from this project was featured have been well attended by state and local cattle breeders' conferences and meetings have usually included in their program one or more phases of the beef cattle breeding in the state or region. It also appears that commercial steer feeders are also showing interest in performance testing programs as a means for locating more efficient feeder cattle.

TABLE 1

CATTLE INVENTORY AND VALUE IN S-10 PROJECTS

July 1, 1959

	Cows 2 yrs & over	Yearling Heifers	Calves Under 12 mos	Bulls over 12 mos	Steers over 12 mos	Total Numbers	Used in Project
STATE							
Alabama	196	34	147	24	17	418	100%
Arkansas	292	83	201	34	1	611	98%
Florida	275	93	170	31	9	578	36%
Georgia	525	141	369	37		1072	100%
Kentucky	40		36	12		88	40%
Louisiana	398	85	218	1		702	100%
Maryland	69	12	52	2	8	143	75%
Mississippi	766	117	536	33	81	1533	75%
No. Carolina	216	40	160	11	54	481	38%
S. Carolina	190	43	108	7		348	50%
Tennessee	848	216	684	50	147	1945	88%
Texas	487	127	372	48	66	1190	100%
Virginia	113		102	6	46	267	100%
W. Virginia	80	30	80	4	16	210	42%
FEDERAL-STATE COOPERATIVE STATIONS							
Brooksville Florida	239	79	174	40	47	579	100%
Jeanerette Louisiana	284	67	152	28	40	571	100%
Front Royal Virginia	433	95	248	45		821	100%
Totals	5451	1262	3809	413	532	11467	85%

TABLE 2
NUMBER OF ANIMALS ON FEEDING AND/OR GRAZING TESTS

1958 - 59

	Bulls		Heifers		Steers		Totals			
STATE	Sta	Coop	Sta	Coop	Sta	Coop	Bulls	Heifers	Steers	All Sexes
Alabama	24	43	66		41		7	66	41	174
Arkansas	66*	9*	18*		189		75	18	189	282
Florida					40				40	40
Georgia	39		40				39	40		79
Kentucky		31*	26	19	27	27	31	45	54	130
Louisiana			83		57			83	57	140
Maryland		58	33		22		58	33	22	113
Mississippi		66			28		66		28	94
North Carolina	21		27	?	48		21	27	48	96
South Carolina	5				31*		5		31	36
Tennessee	35		163				35	163		198
Texas	31	331	117	84	103	26	362	201	129	692
Virginia			45		44			45	44	89
West Virginia					16					16
FEDERAL-STATE COOPERATIVE STATIONS										
Brookville Florida	43	41	99		35		84	99	35	218
Jeanerette Louisiana	29*				40		29		40	69
Front Royal Virginia	52		85		24		52	85	24	161
Totals	345	579	802	103	745	53	924	905	778	2,127

*Part or all fed individually.

TABLE 3

NUMBER OF COWS IN DIFFERENT TYPES OF MATINGS FOR 1958 CALVES AT STATIONS COOPERATING IN S-10 PROJECT

Type of Mating	Number of Matings by States														
	Ala	Ark	Fla	Ga	Ky	La	Md	Miss	N.C.	S.C.	Tenn	Tex	Va	WVa	Total
Inter se															
Angus (A)	49	205	66	68		36	34	129	19	57	268	13	245	38	1227
Hereford (H)	79	73	37	130	17	8	33	120	152	40	714	158	157	58	1776
Shorthorn (Sh)	14	16	20						12				185		247
Devon (D)			36												36
Brahman (B)			128			41						20			189
Santa Gert. (SG)			54	24								6			84
Brangus (BA)			44			148									192
Brah-Herf												18			18
Afrik-Ang						63									63
Crosses															
A - H	12			25		16							25		78
A - Sh	12					7				9			21		49
H - Sh	12					8							24		44
A - H - Sh										11			30		41
H - RP					20										20
B - A			131			21									152
B - H			59			16						128			203
B - Sh			320			8									328
B - A - Sh										10					10
B - H - Sh										10					10
B - D			52												52
B - Sindhi						10									10
B - BA						16									16
H - BA						16									16
SG - A				11											11
SG - H				26								21			47
SG - RP												13			13
SG - A - H				30											30
SG - B - H												21			21
SG - B - H - RP												4			4
C - A						8									8
C - H						5						5			10
C - B						7									7
C - CB												22			22
C - BA						8									8
C - B - H												8			8
TOTAL	178	294	947	314	37	442	67	249	183	137	982	437	687	96	5050

Breeds or strains not shown in those abbreviated in the table are as follows: Afrikander (Afrik); Charbray (CB); Charolaise (C); Red Polled (R.P.).

ALABAMA STATION

-by-
Troy B. Patterson, W. M. Warren and G. B. Meadows

I. Project Title:

The Improvement of the Beef Cattle of Alabama Through Breeding Methods. Anim. Husb. and Nutr. 525 (S-10) Coop. ARS

II. Objectives:

(1) To determine the effectiveness of mass selection for total performance in beef cattle.

(2) To develop criteria for evaluating and selecting breeding animals.

(3) To study the influence of heterosis in crosses between the three British breeds of beef cattle.

III. Accomplishments During the Year:

(1) Facilities and Cattle Required: Two hundred and twenty cows are devoted to this project of which 17 are crossbred replacements, 30 are purebred Shorthorns, 72 are purebred Angus and 101 are purebred Herefords. There are 950 acres of land used exclusively for this project. Approximately 600 acres have been cleared or are in the process of being cleared. Additional cleared land and cattle numbers will be necessary as the cross-breeding phase of this study progresses.

(2) Research Results: Data collected during the year on the calves and cows include: birth weight, 180-day weight and score, 250-day weight and score (weaning) and milk production of dams at 250 days. Correlation between weaning weight of calves and milk production of dams at 250 days on 103 pairs was 0.48.

Forty-three purebred heifers and 19 selected bulls completed a post-weaning performance test. Four bulls and 15 heifers were saved for replacements. In addition 17 heifers were saved to go into the cross-breeding program.

Twenty-five purebred and crossbred steers have completed a 180-day feeding period. Slaughter data will be obtained on these steers.

Twenty-seven older steers were fed out and carcass data obtained.

IV. Future Plans:

(1) Continuation of the three main objectives.

(2) Further pursue the relation of milk production of the dam and weight of calf. Studies will be made at 90, 180, and 250-days after parturition.

V. Publication During the Year: None.

VI. Publications Planned: None.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Line or group designation (1)	PB	PB	PB	CB	CB
Location	Auburn	Auburn	Auburn	Auburn	Auburn
Breeding of calves	Angus	Hereford	Shorthorn	Angus	Hereford
Av. inbreeding (%)	0	0	0.035		
Bulls, No.	6	16	2		
Av. inbreeding (%)	0	0	0.035		
Av. weaning wt. (lbs)	536	514	445		
Av. initial age (days)	374	326	300		
Av. initial wt. (lbs)	720	614	536		
Length of feeding period (days)	140	140	140		
Av. daily gain (lbs)	1.91	2.12	2.14		
Av. score	12.3	12.8	13.5		
Feed per cwt. gain (lbs)					
Concentrates		GROUP FED			
Roughage					
Steers, No.				3	5
Av. inbreeding (%)				0	0
Av. weaning wt. (lbs)				453	354
Av. initial age (days)				402	390
Av. initial wt. (lbs)				543	426
Length of feeding period (days)				180	180
Av. daily gain (lbs)				1.90	1.89
Av. score				13	12
Feed per cwt. gain (lbs)					
Concentrates		GROUP FED			
Roughage					
Heifers, No.	21	21	1	5	3
Av. inbreeding (%)	0	0	0	0	0
Av. weaning wt. (lbs)	452	437	435	422	425
Av. initial age (days)	377	354	369	374	363
Av. initial wt. (lbs)	486	480	445	464	475
Length of feeding period (days)	131	131	131	131	131
Av. daily gain (lbs)	1.59	1.27	1.18	1.47	1.35
Av. score	11.3	11.3	11.0	11.2	12.0
Feed per cwt. gain (lbs)					
Concentrates		GROUP FED			
Roughage					

(1) PB and CB denote herds in purebred and crossbreeding experiments, respectively.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Line or group designation	CB	CB	CB	CB
Location	Auburn	Auburn	Auburn	Auburn
Breeding of calves	Shorthorn	Angus X Hereford	Angus X Shorthorn	Hereford X Shorthorn
Av. inbreeding (%)				
Steers, No.	7	3	3	4
Av. inbreeding (%)	0	0	0	0
Av. weaning wt. (lbs)	433	487	435	492
Av. initial age (days)	377	383	373	355
Av. initial wt. (lbs)	484	533	492	568
Length of feeding period (days)	180	180	180	180
Av. daily gain (lbs)	2.15	2.13	1.97	2.04
Av. score	13	13	12	13
Feed Per cwt. gain (lbs)				
Concentrates				
Roughage		GROUP FED		
Heifers, No.		6	4	5
Av. inbreeding (%)		0	0	0
Av. weaning wt. (lbs)		417	443	476
Av. initial age (days)		377	380	340
Av. initial wt. (lbs)		458	491	526
Length of feeding period (days)		131	131	131
Av. daily gain (lbs)		1.64	1.52	1.42
Av. score		11.5	10.8	11.8
Feed per cwt. gain (lbs)				
Concentrates		GROUP FED		
Roughage				

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1958

Line or group designation	Purebreds	Purebreds	Purebreds
Breeding:	Angus	Hereford	Shorthorn
Sex:	Steers	Steers	Steers
No.	4	11	1
Av. age (fall 1957)	357	345	391
Av. wt. (fall 1957)	510	544	580
Days on pasture	227	227	227
Av. gain on pasture	1.32	1.08	1.45
Days on feed	169	169	169
Av. wt. adjusted to 18 or 30 months of age	820	778	798
Av. gain on feed	1.51	1.85	2.22
Animals slaughtered:			
Averages at slaughter			
Age	753	741	787
Weight	1064	1104	1285
Live Grade	12	12.0	13.0
Dressing percent	59.1	59.0	60.8
Carcass grade	12.8	11.2	10.0

Line or group designation	Purebreds	Purebreds	Purebreds
Breeding:	Angus	Hereford	Shorthorn
Sex:	Steers	Steers	Steers
No.	4	5	2
Av. age (fall 1957)	378	353	332
Av. wt. (fall 1957)	569	507	485
Days on pasture	0	0	0
Days on feed	210	210	210
Av. wt. adjusted to 18 or 30 months of age	854	820	907
Av. gain on feed	1.61	1.63	1.94
Animals slaughtered:			
Averages at slaughter	577	563	542
Age			
Weight	908	849	892
Live grade	13	12	13
Dressing percent	62.3	61.7	62.2
Carcass grade	13.5	12.4	12.0

PERFORMANCE OF COW HERDS, 195[illegible] CALVES

PLH

Line or group designation Location Breed of sire Breed of dam No. cows bred	Crossbred Auburn Angus Hereford 6	Crossbred Auburn Angus Shorthorn 6	Crossbred Auburn Hereford Angus 6	Crossbred Auburn Hereford Shorthorn 6	Crossbred Auburn Shorthorn Angus 6	Crossbred Auburn Shorthorn Hereford 6
No. cows calving	5	3	6	4	5	5
No. cows raised	4	3	5	4	4	5
Av. inbr. of dams (%)	0	0	0	0	0	0
Av. inbr. of calves (%)	0	0	0	0	0	0
Av. birth date	11/6/57/	11/1/57	11/13/57	11/27/57	11/9/57	12/29/57
Av. birth wt. (lbs):						
Bulls	60.0	44.0	73	72	58	75
Heifers	61.0	61.0	60	71	63	71
Were calves creep fed?	No	No	No	No	No	No
Av. weaning date:						
Steers	7/13/58	9/4/58	7/29/58	7/29/58	7/28/58	9/13/58
Heifers	7/24/58	7/8/58	7/15/58	8/11/58	7/29/58	8/31/58
Av. weaning weight:						
Steers	460	440	500	507	432	478
Heifers	413	417.5	422	500	463	460
Adjusted av. daily gain - birth to weaning*	1.63	1.60	1.68	1.79	1.70	1.72
Av. weaning type score:						
Heifers	11.0	10.5	11.0	11.5	10.0	11.0
Av. weaning condition score:						
Steers	11.0	10.0	12.5	12.5	11.5	11.0
Heifers	11.0	10.5	11.0	12.0	10.5	11.0

*Steer equivalent and age of dam. All calves weaned at 250 days.

PERFORMANCE OF COW HERDS, 1958 CALVES

Line or group designation Location Breed of sire Breed of dam No. cows bred	Purebred Auburn Angus Angus 37	Purebred Auburn Hereford Hereford 67	Purebred Auburn Shorthorn Shorthorn 2	Crossbred Auburn Angus Angus 12	Crossbred Auburn Hereford Hereford 12	Crossbred Auburn Shorthorn Shorthorn 12
No. cows calving	33	52	2	10	10	10
No. cows raised	30	50	2	8	9	9
Av. inbr. of dams (%)	0	0	0	0	0	0
Av. inbr. of calves (%)	0	0	0	0	0	0
Av. birth date	11/9/57	12/12/57	1/19/58	11/5/57	11/10/57	11/17/57
Av. birth wt. (lbs):						
Bulls	58	70	72	53	58	71
Heifers	57	64	69	60	64	--
Were calves creep fed?	No	No	No	No	No	No
Av. weaning date:						
Bulls	7/21/58	8/22/58	12/1/58	--		
Steers	8/3/58	9/18/58	--	7/5/58	7/12/58	7/25/58
Heifers	7/15/58	8/2/58	7/23/58	7/18/58	7/29/58	--
Av. weaning wt.:						
Bulls	544	502	402	--		
Steers	447	450	--	451	340	439
Heifers	456	436	435	425	428	--
Adjusted av. daily gain - birth to weaning*	1.65	1.63	1.31	1.66	1.35	1.47
Av. weaning type score:						
Bulls	12.2	12.1	13.0			
Steers						
Heifers	11.0	11.6	12.0	11.0	10.0	
Av. weaning condition score:						
Bulls	11.0	11.0	8.0			
Steers	11.0	10.1		11.0	9.5	10.4
Heifers	11.1	11.0	12.0	11.2	10.6	

ARKANSAS STATION
-by-
C. J. Brown

I. Project Title:

Evaluation of Performance Records of Beef Cattle. Anim. Indus. and Vet. Sci. 170 (S-10) Coop. ARS

II. Objectives:

To develop practical but adequate methods for identifying, evaluating and propagating the genetic potential for the production of beef. This would involve determination of the kind and number of performance records necessary to prove beef sires and dams, as well as the proper use of records in planning matings.

III. Accomplishments During the Year:

(a) At the Main Experiment Station the breeding herds consist of Aberdeen Angus, Hereford and Shorthorn cattle which are pastured on approximately 3,100 acres. Roughly one-half of the 3,100 acres is brush and woodland. A two sire herd of Aberdeen Angus are maintained at the Livestock and Forestry Branch Experiment Station near Batesville. All cattle are purebred and registered in their respective breed associations. Feeding and management practices followed are those recommended for sound commercial production in the area. The following facilities were acquired during the last year: Approximately two miles of fence was built. Pasture fertilization and development was continued. Four weaned Hereford bull calves were purchased. One two year old Angus bull was purchased.

(b) Results of research conducted are in various stages of summary. The data collected deal with the following phases of performance. Sixty-two bulls were individually fed for 154 days to record gains and efficiency under standard conditions. A selected group of 26 of these bulls were sold at the eighth annual beef cattle study day and performance tested bull sale held by the Experiment Station. Six Hereford, 6 Angus, and 6 Charbray heifers were fed on a similar test.

All animals in the herds were classified for type and breeding worth by a committee of judges and were weighed and measured at regular intervals according to the procedures outlined before S-10 in previous reports.

Milk production and behavior patterns of 21 Aberdeen Angus calves and dams were recorded. Data of this and the previous year were summarized and prepared for publication.

Data on weights and measurements have been transcribed on IBM cards. Programs for a G-15D Bendix Electronic Computer to compute age and to interpolate weights have been prepared.

IV. Future Plans:

Future plans are to continue collection of data and evaluation of records dealing with rate and efficiency of gain, visual appraisal, growth and development, mothering ability and reproduction according to project outlines.

V. Publications:

Krehbiel, Elmer, 1959. Effectiveness of Selection for Type by Scorecard in a Small Herd of Aberdeen Angus Cattle. Master's Thesis, University of Arkansas Library.

Krehbiel, Elmer, C. J. Brown, Warren Gifford, and Charles Mabry, 1958. Effectiveness of Selection for Type by Scorecard in a Small Herd of Aberdeen Angus Cattle. J. Anim. Sci. 17:1138 (Abstract).

Drewry, Kenneth, C. J. Brown and R. S. Honea, 1958. Relationships Among Factors Associated with Mothering Ability in Beef Cattle. pp. 87, Proc. Assoc. So. Agr. Workers, Submitted to Journ. Anim. Sci.

VI. Publications Planned:

Bulletin on Feedlot Performance of Bulls

Bulletin on Selection for Type

Bulletin on Cow Performance

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Line or group designation	F80	Eric	Mac	1151	749	257	Coronet
Location	Main Sta.	Main Sta.	L. + F.	Sta.	L. + F. Sta.	L. + F. Sta.	Main Sta.
Breeding of calves	Angus	Angus	Angus	Angus	Angus	Angus	Shorthorn
Av. inbreeding (%)							
Bulls, No.	9	9	2	4	3	2	6
Av. inbreeding (%)	0	.35	0	1.32	.29	0	0
Av. weaning wt. (lbs)	371	376	407	402	354	284	362
Av. Initial age (days)	243	229	264	223	207	217	211
Av. initial wt. (lbs)	380	351	421	429	358	326	381
Length of feeding period (days)	154	154	154	154	154	154	154
Av. daily gain (lbs)	1.84	1.95	1.80	1.98	1.64	1.84	1.77
Av. score type conditions	65	66	70	65	70	64	66
Feed per cwt. gain (lbs)							
Concentrates	508	518	534	514	524	466	590
Roughage	254	259	267	257	262	233	295

Line or group designation	DM82	267	P: V: 27	Coding	Mellow	E. 415	160 A. V.
Location	Main Sta.	Main Sta.	Main Sta.	Main Sta.	Main Sta.	Main Sta.	Main Sta.
Breeding of calves	Hereford	Hereford	Hereford	Hereford	Hereford	Angus	Angus
Av. inbreeding (%)							
Bulls, No.	11	2	4	4	2	5	1
Av. inbreeding (%)	0	0	3.51	-	-	-	2.34
Av. weaning wt. (lbs)	366	337	-	-	-	-	552
Av. initial age (days)	224	202	231	-	225	283	267
Av. initial wt. (lbs)	389	365	436	566	470	402	630
Length of feeding period (days)	154	154	154	154	154	154	154
Av. daily gain (lbs)	1.89	1.79	1.99	2.37	2.19	1.91	1.33
Av. score type conditions	68	68	73	66	70	67	84
Feed per cwt. gain (lbs)							

PERFORMANCE OF COW HERDS, 1958 CALVES

Line or group designation							
Location	Main Sta.	Main Sta.	Main Sta.	Main Sta.	Main Sta.	L. & F. Sta.	L. & F. Sta.
Breed of sire	Angus	Angus	Shorthorn	Hereford	Hereford	Angus	Angus
Breed of dam							
No. cows bred	52	79	16	36	37	39	35
No. cows calving	36	36	11	24	20	20	20
No. cows raised							
Av. inbr. of dams (%)	.91	1.38	0	0	0	.41	.24
Av. inbr. of calves (%)	6.12	9.59	0	0	0	1.01	1.54
Av. birth date	10/18/57	2/28/58	10/15/57	10/22/57	3/7/58	9/27/57	3/8/58
Av. birth wt. (lbs):							
Bulls	57	60	69	73	71	54	55
Heifers	54	57	61	67	68	53	58
Were calves creep fed?	No	No	No	No	No	No	No
Av. weaning date:							
Bulls	4/25/58	10/7/58	5/8/58	4/10/58	10/9/58	4/18/58	10/2/58
Steers	4/25/58	9/10/58					
Heifers	4/23/58	9/28/58/	5/10/58	4/25/58	10/1/58	4/15/58	10/4/58
Av. weaning wt.:							
Bulls	359	420	384	355	420	385	365
Steers	341	445					
Heifers	354	407	384	358	421	358	365

FLORIDA STATION

-by-

Marvin Koger

I. Project Titles:

Breeding beef cattle for adaptation to Florida. Fla. 390 (S-10).

Influence of breed composition and level of nutrition on adaptability of cattle to central Florida conditions. Fla. 615.

II. Objectives:

A. To determine the value of different crosses and strains of cattle for foundation animals and commercial beef production.

B. To determine the relative productivity of cows with different proportions of European and Brahman blood when run under pasture programs designed to supply low, medium and good nutrition.

III. Accomplishments During the Year:

A. Purchased 5 purebred Shorthorn cows, one with calf at foot and the other four cows pregnant.

B. Three breeding herds of 60 cows each to be kept on pasture throughout the year.
Herd 1 on 800 acres of native range, 5 pastures of 160 acres each, one-half of which is burned each winter.
Herd 2 grazed 310 acres of native range and 75 acres of improved pasture. One half native pasture burned each year and improved pasture fertilized twice yearly.
Herd 3 kept on 75 acres of pangola pasture, 20 acres of which was overplanted with white clover under irrigation.
Winter of 1957-58 was the worst on record because of heavy rains and severe frost from December 1957 to March 1958. It was necessary to feed all three herds and also to provide Herd 3 with additional pasture. Calves in 1958 were well grown but weighed less at weaning because they carried less finish. Many cows nursing calves in 1958 did not breed because of being in poor flesh.

IV. Future Plans:

Future plans are to continue these projects for several more years and to obtain uniform cattle with the three herds.

V. Publications:

Feed Lot Performance and Carcass Grades of Brahman and Brahman-Shorthorn Steers. Peacock, Fentress M., W. G. Kirk. Agr. Exp. Sta. Bul. 597, Fla.

VI. Publications Planned:

A. "Genetic and environmental influence of weaning weight and slaughter grade of Brahman, Shorthorn and Brahman-Shorthorn crossbred calves."

B. "Genetic and environmental influences of weaning weight and slaughter grade of calves produced from 1942 to 1958 at Range Cattle Station."

PERFORMANCE OF COW HERDS. 1958 CALVES
Ona, Florida

Line or group designation	Project 615						Other*	
Breed of sire	B	B	B	SH	SH	SH	B	SH
Breed of dam	B	3/4B	1/2B	1/2B	1/4B	SH	variable	
No. cows bred	26	29	24	24	24	20	272	
No. cows calving	22	25	20	21	19	15	227	
No. calves raised	19	21	19	21	19	13	208	
Av. birth date	2/13	2/12	1/24	2/5	2/4	1/24	2/4	
Av. birth wt. (lbs):								
Bulls								
Heifers								
Were calves creep fed?	No	No	No	No	No	No	No	
Av. weaning date:	9/15/58							
Bulls								
Steers								
Heifers								
Av. weaning wt.:	354	406	447	436	373	295	435	
Bulls								
Steers								
Heifers								
Adjusted av. daily gain - birth to weaning	1.5	1.7	1.7	1.8	1.5	1.1	1.8	
Av. weaning type score:	8.9	9.2	9.9	10.8	10.1	9.9	9.9	
Bulls								
Steers								
Heifers								
Av. weaning condition score:	7.7	8.4	9.3	9.8	8.6	8.0	9.2	
Bulls								
Steers								
Heifers								
Calves slaughtered at weaning:								
Steer or bull calves								
No.		1	1	2	1			
Av. age		218	244	221	183			
Av. wt.		470	560	443	280			
Av. slaughter grade		7	10	10	7			
Av. dressing per cent		58.64	55.78	58.61	57.03			
Av. carcass grade		7	9	10	7			

*Includes all cattle other than those in Project 615 pastures and 10 cows of odd breeds from Project 615 pastures.

Fla

PERFORMANCE OF CO-OP HERDS.--1958 CALVES
Beef Research Unit
Gainesville, Florida

Location	--------Gainesville--------	
Breed of sire	Angus	Hereford
Breed of dam	Crossbred	Crossbred
No. cows bred	111	59
No. cows calving	87	48
No. cows raised	30	46
Av. birth date	1/10	1/8
Av. birth wt. (lbs):	56	64
Bulls		
Heifers		
Were calves creep fed?	No	No
Av. weaning date:	8/20/58	8/20/58
Bulls		
Steers		
Heifers		
Av. weaning wt.:	409	447
Bulls		
Steers		
Heifers		
Adjusted av. daily gain - birth to weaning	1.7	1.8
Av. weaning type score:	10.6	10.8
Bulls		
Steers		
Heifers		
Av. weaning condition score:	8.9	9.6
Bulls		
Steers		
Heifers		

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)
Gainesville, Florida

Location	Beef Research Unit		
Breeding of calves	Crossbred		
Av. inbreeding (%)			
Steers, No.	15(1)	15(2)	16(3)
Av. inbreeding (%)			
Av. weaning wt. (lbs)	464	443	463
Av. initial age (days)	216	397	391
Av. initial wt. (lbs)	464	499	739
Length of feeding period (days)	175	96	119
Av. daily gain (lbs)	1.6	2.6	1.5
Av. slaughter grade	9.4	7.7	9.9
Feed per cwt. gain (lbs)	1031		1429
Concentrates		554	
Roughage		Pasture	

(1) Placed on feed immediately following weaning from 8/22/57 to 2/13/58.
(2) Fed limited grain on pasture from 3/1/58 to 6/5/58.
(3)

PERFORMANCE OF COW HERDS. 1958 CALVES
(Herds not in projects contributing to S-10)

Location	Belle Glade, Florida							
Breed of sire	Angus		Brahman		Brah.	Devon	Devon	Crossbred
Breed of dam	Angus	BXA	Brah.	Dev.	BXD	Dev.	BXD	BXD
No. cows bred	33	20	17	9	18	36	25	54
No. cows calving	33	19	13	6	16	30	22	41
No. calves raised	30	16	11	5	14	13	20	35
Av. birth date	11/7	11/4	12/3	11/29	11/21	11/39	11/22	11/22
Were calves creep fed?	No	No	No	No	No	No	No	No
Av. weaning date:	6/10/58							
Bulls								
Steers								
Heifers								
Av. weaning wt.:	259	316	270	248	292	242	259	281
Bulls								
Steers								
Heifers								
Adjusted av. daily gain - birth to weaning	1.1	1.3	1.3	1.1	1.3	1.1	1.1	1.3
Av. weaning type score:	9.1	9.3	7.6	7.4	7.7	7.2	7.3	7.8
Bulls								
Steers								
Heifers								
Av. weaning condition score:	6.5	7.4	6.2	6.0	6.4	5.5	5.9	6.3
Bulls								
Steers								
Heifers								

I. Project Title:

Genetics of Dwarfism in Beef Cattle, State 752 (S-10) Coop ARS.

II. Objectives:

A. To characterize the various types of dwarfism in beef cattle in Florida.

B. To investigate the genetic relationship between the more prevalent types of dwarfism.

C. To determine the influence of genetic environment on expression of the snorter dwarf gene.

III. Accomplishments During the Year:

Physiological studies completed during the year showed that the mean corpuscular volume and RNA content of blood plasma from known carrier cows were significantly higher than those from dwarf-free animals. There was a highly significant difference in DNA in favor of non-carrier animals. Cerebrospinal fluid pressure was higher in non-carrier cattle at both the atlas-axis juncture and in the lumbar-sacral region. Differences were significant at the atlas-axis juncture. Varying degrees of overlap for all of the items studied, however, prevented differentiation of the carrier and non-carrier groups with an acceptable degree of accuracy for diagnostic purposes.

Additional test matings were made involving dwarfs or known carriers of the following: Midget Brahman, guinea (Dexter), snorter Hereford, compact Shorthorn, long-headed Shorthorn and long-headed Angus. More calves are needed before drawing conclusions from these matings.

A progeny test on a "comprest" Angus was completed making the third of three tested that has sired more dwarf calves than would be expected on the assumption that the bulls in question were heterozygous for a monofactorial trait.

IV. Future Plans:

More critical test matings will be made. Support is being sought to expand the work on physiological expressions of the dwarf gene.

V. Publications:

Dollahon, J. C. Genetic, Anatomical and Physiological Aspects of Dwarfism in Cattle. Ph. D. Dissertation, University of Florida, June, 1958.

Dollahon, J. C., et al. A Comparison of Certain Blood Constituents of Dwarf-Carrier and Non-Carrier Cattle. In press, Journal of Animal Science.

Dollahon, J. C., et al. Cerebrospinal Fluid Pressures of Snorter Dwarf Carrier and Non-Carrier Cattle. In press. Journal of American Veterinary Medicines Association.

Collahon, J. C. and M. Koger. The Inheritance of the Guinea Trait in Descendants of Florida Native Cattle. Submitted to Journal of Heredity.

BROOKSVILLE STATION
-by-
W. C. Burns

I. Project Title.

Selection of Cattle for Beef Production in Southeastern United States. Fla. 629 (S-10) Coop ARS.

II. Objectives:

To improve the reproductive efficiency and meat producing qualities of different strains of cattle under Florida conditions. To test various breeding systems with these cattle and to determine if combining ability will provide a means of increasing the rate of improvement by cross-progeny testing.

III. Accomplishments During the Year:

A. A 40 x 72' hay shed installed.

B. Creep feeders installed in most of the pastures.

C. Fence erected around Turnley area.

D. Lanes and working pens built.

E. One hundred fifty acres of new land cleared, making a total of approximately 1250 acres of improved pasture. Cattle acquired during the year were 28 head of Angus cows and calves, eleven head of Hereford calves. There are now 269 head of breeding age animals plus 108 head of yearling heifers. The research results for the past year are included in this report.

IV. Future Plans:

Future plans call for the clearing of approximately 450 acres, by farmers, to establish a separate unit of around 250 head of cattle to test "Combining Ability." To establish permanent pastures, water facilities, fences, etc, at this new area. To increase the purebred herds to about 60 head in each breed.

V. Publications:

A. Mimeographed Annual Report.

B. Mimeographed Results of the Bull Feeding Tests.

VI. Publications Planned:

A. Beef Cattle Production at West Central Florida Experiment Station, Brooksville, Florida. 1953-1958.

B. The Effect of Breed, Alfalfa Leaf Meal and Stilbesterol Implantation on Steers at West Central Florida Experiment Station. 1957-1958.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)
Brooksville, Florida

Line or group designation	Angus	Brahman	Bra-Angus	Hereford	SG
Location	Brooksville, Florida				
Breeding of calves	Angus	Brahman	Bra-Angus	Hereford	SG
Bulls, No.	5	4	4	4	6
Av. inbreeding (%)					
Av. weaning wt. (lbs)	388	433	470	352	497
Av. initial age (days)	293	274	276	293	290
Av. initial wt. (lbs)	459	457	516	404	570
Length of feeding period (days)	140	140	140	140	140
Av. daily gain (lbs)	1.7	2.2	2.0	2.0	2.3
Av. score type conditions	8.0	8.5	7.5	8.2	7.5
Feed per cwt. gain (lbs)					
Concentrates		All breeds fed together			
Roughage					
Steers, No.	8	4	8	8	8
Av. inbreeding (%)					
Av. weaning wt. (lbs)	337	326	399	306	417
Av. initial age (days)	406	377	405	394	404
Av. initial wt. (lbs)	494	520	625	459	617
Length of feeding period (days)	139	139	139	139	139
Av. daily gain (lbs)	2.0	2.4	2.3	2.3	2.8
Av. score type conditions	10.1	8.0	9.3	8.9	7.9
Feed per cwt. gain (lbs)					
Concentrates		All breeds fed together			
Roughage					
Heifers, No.	11	9	17	12	9
Av. inbreeding (%)					
Av. weaning wt. (lbs)	330	340	395	312	411
Av. initial age (days)	301	265	276	277	280
Av. initial wt. (lbs)	382	389	434	377	466
Length of feeding period (days)	126	126	126	126	126
Av. daily gain (lsb)	.70	.64	.57	.56	.71
Av. score type conditions	6.3	7.2	8.2	6.7	7.7
Feed per cwt. gains (lbs)					
Concentrates		All breeds fed together			
Roughage					

PRODUCTION AND/OR ALAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1958
Brooksville, Florida

Line or group designation	Angus	Brahman	Bra-Angus	Hereford	SG
Breeding:	F	F	F	F	F
Sex:	F	F	F	F	F
No.	11	9	17	12	9
Av. age (fall 1957)					
Av. wt. (fall 1957)	383	389	433	377	466
Days on pasture*	165	165	165	165	165
Av. gain on pasture	181	212	185	209	209
Days on feed*	128	128	128	128	128
Av. wt. adjusted to 18 or 30 months of age**	599	633	652	593	710
Av. gain on feed	88	81	72	72	90

*Heifers were lotted to three wintering programs receiving all the silage, hay or 1/2 hay-1/2 silage they would eat, plus 7 1/2 lbs. concentrate feed/day. Heifers were run together during the spring and summer without any supplemental feed.

**18-months weight.

PERFORMANCE OF COW HERDS. 1958 CALVES
Brooksville, Florida

Line or group designation	Angus	Hereford	Brahman	SG	Bra-Ang
Breed of sire	Angus	Hereford	Brahman	SG	Bra-Ang
Breed of dam	Angus	Hereford	Brahman	SG	Bra-Ang
No. cows bred	30	37	32	54	44
No. cows calving	25	30			
No. cows raised	24	26	15	41	37
Av. birth date	1/11/58	1/19/58	2/3/58	2/3/58	2/3/58
Av. birth wt. (lbs)					
Bulls	64	65	60	71	70
Heifers	58	58	58	60	60
Were calves creep fed?	One-half calves of each breed creep fed.				
Av. weaning date:	8/18/58	8/18/58	8/18/58	8/18/58	8/18/58
Bulls					
Steers					
Heifers					
Av. weaning wt.:					
Bulls	433	376	422	451	452
Steers	380	383	336	439	398
Heifers	348	359	361	423	400
Adjusted av. daily gain - birth to weaning	1.7	1.5	1.7	1.9	1.8
Av. weaning type score:					
Bulls	11.1	10.6	9.3	9.3	9.0
Steers	10.2	10.5	8.0	8.8	8.4
Heifers	10.0	10.8	8.7	9.8	8.9
Av. weaning condition score:					
Bulls	9.6	8.2	8.6	8.1	8.7
Steers	8.7	8.5	8.0	9.3	8.6
Heifers	8.7	8.5	7.8	9.8	9.6

GEORGIA STATION

-by-
W. C. McCormick and B. L. Southwell

I. Project Title:

The Improvement of Beef Cattle in Georgia Through the Use of Selection for Economic Factors Brought Out in the Process of Inbreeding, Crossbreeding and Outbreeding. Anim. Husb. 1. 1-2-3-(S-10)

II. Objectives:

A. Sire testing studies with Polled Hereford and Angus Cattle.

B. To study the relative value of grading, crisscrossing and rotational crossing as breeding systems for commercial beef production.

C. A study of selection of beef cattle for single items of importance in profitable beef production.

III. Accomplishments During the Year:

A. The Polled Hereford herd of approximately 100 females and the Angus herd of approximately 40 females are used to progeny test sires. Both outcross and promising young bulls raised within the herds are used on the two herds. Approximately 25 of the superior Polled Hereford females are bred to the sire with the best record. Emphasis is placed on performance in selecting replacement heifers and prospective sires for these two herds. Major emphasis is placed on weaned weight, growthiness and type score. Bulls raised in these herds are used in the projects following which are being carried on at Reidsville. The following table summarizes the sire group records for 1957-58.

		No. Progeny		Rate of Gain		Type Score		Final Rating	
Breed	Sire	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers
P.H.	565	6	7	2.36	2.05	26.6	31.6	73.8	72.7
P.H.	543	7	8	2.44	1.89	30.8	31.1	79.7	68.9
P.H.	534	6	6	2.48	1.75	29.4	29.5	79.0	62.5
P.H.	513	5	10	2.50	1.97	27.4	32.0	77.4	71.3
P.H.	562	3	5	2.26	2.02	30.3	33.8	75.0	74.2
Angus	P-103	6	9	2.49	1.69	33.0	32.4	82.8	66.0
Angus	W-136	7	10	2.32	1.65	31.1	35.2	77.5	68.2

The calves were weaned at approximately seven months of age, fed 28 days as a preliminary period and then full-fed 140 days for the test period. The ration fed was mixed and contained 60 pounds ground snapped corn, 15 pounds 41% cottonseed meal, and 25 pounds ground Coastal Bermuda hay. The calves were scored at the end of the test according to the S-10 form. This score was converted to a basis of 50 points as reported here. The final rating was then obtained from the following equation.

$$\text{Rating} = \text{Type score} + \frac{\text{Avg. daily gain}}{.05}$$

B. The following experimental cow herds have been established at the State Prison Farm in Reidsville according to the schedule listed.

Breeding Systems	Breeding Herds	Year Born 1954	1955	1956	1957	Total
Grading	Grade Angus	14	11	7	8	40
	Grade Polled Hereford	14	11	7	8	40
	Grade Santa Gertrudis	9	17	7	8	41
Criss-crossing	Angus x Polled Hereford	14	11	8	8	41
	Angus x Santa Gertrudis	6	5	10	19	40
	Polled Hereford x Santa Gertrudis	9	18	5	8	40
Rotational Crossing	Angus x Polled Hereford x Santa Gertrudis	14	16	13	17	60

As noted above the calves born in 1957 completed the herds and thus breeding with all original females in the herds will occur first in the spring of 1959. Animals born in 1954 produced the second crop of calves in 1958 while the animals born in 1955 produced the first crop in 1958. The average performance of these herds was as follows:

Herd	No. Born	Calves Weaned	Birth Weight	% Calf Crop	A.D.G. Birth-Weaning	Weaning Score* Slaughter	Feeder
G.A.	22	19	58.9	92	1.60	8.5	10.8
G.H.	23	22	65.7	92	1.54	8.4	10.5
G.S.G.	20	18	72.9	88	1.84	8.3	8.7
A x H	23	23	63.2	96	1.73	8.8	10.7
A x S.G.	11	10	61.6	100	1.72	8.8	10.2
H x S.G.	28	27	62.3	108	1.72	8.9	9.8
A x H x S.G.	28	28	67.9	93	1.84	9.0	9.8

*According to S-10 form.

As previously indicated, Polled Hereford and Angus sires are selected from the Tifton herd and Santa Gertrudis sires are obtained from the West Central Florida Experiment Station, Brooksville, Florida. Sires are used two years only. Replacement of sires is staggered so that one-half of the needed number of sires is added each year and one-half is retired. Cows are randomized within age groups each year to sires. The cows from all groups are allotted to all sires of the particular breed to which they are supposed to be mated. During the breeding season the cows are in bull units, otherwise they are managed in large groups. The animals are pasture bred from April to July. The calves are weaned in the fall at an average age of approximately seven and one-half months. The calves are scored at weaning.

C. Four groups of 50 grade Polled Hereford females each are being established to study selection for weaned weight, rate of gain, and visual appraisal or score. The fourth group will be considered an average herd. Bulls mated to these herds are obtained from Tifton. The top Polled Hereford bulls in respect to rate of gain, type score and weaned weight will be mated to these three selection herds. The average herd will be mated to the bull whose mean performance for weaned weight, rate of gain, and score is closest to the average of all Polled Hereford bulls at the Tifton station. Bulls in these herds will also be used for two years and a staggered plan of replacements will be followed.

Approximately 40 females have been added to each herd. The first group of calves were born in the spring of 1959. Thus, information on this project will necessarily have to be reported in the next report.

IV. Future Plans:

All projects will be continued as outlined. No publications other than routine reports have been planned. During the fall of 1958 a Performance Testing Station was constructed at Tifton. The first group of calves was fed in 1958-59. Pertinent information obtained from this activity will be reported in future reports.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)
Georgia Coastal Plain Experiment Station

Line or group designation	PB Hereford	Angus
Location	--------Tifton, Georgia---	
Bulls, No.	27	14
Av. weaning wt. (lbs)	378	445
Av. initial age (days)	246	246
Av. initial wt. (lbs)	411	482
Length of feeding period (days)	140	140
Av. daily gain (lbs)	2.42	2.27
Av. score type conditions*	9.8-9.1	10.9-10.3
Feed per cwt. gain (lbs)	689	825
Concentrates		
Roughage		
Heifers, No.	36	19
Av.		
Heifers, No.	36	19
Av. weaning wt. (lbs)	373	376
Av. initial age (days)	250	247
Av. intiial wt. (lbs)	383	404
Length of feeding period(days)	140	140
Av. daily gain (lbs)	1.94	1.67
Av. score type conditions	10.5-9.4	11.5-10.3
Feed per cwt. gain (lbs)	844**	844**
Concentrates		
Roughage		

* First score type - second condition.

** Angus and Hereford Heifers fed as a group.

PERFORMANCE OF COW HERDS. 1958 CALVES
Tifton, Georgia

Line or group designation	Angus	PB Hereford
Location	----Tifton, Georgia----	
Breed of sire	Angus	PB Hereford
Breed of dam	Angus	PB Hereford
No. cows bred	43	105
No. cows calving	32	63
No. cows raised	30	58
Av. birth date	1/29/58	2/8/58
Av. birth wt. (lbs):	57.7	66.7
Bulls	55.9	68.8
Heifers	59.8	64.8
Were calves creep fed?	Yes	Yes
Av. weaning date:	9/17/58	9/17/58
Bulls		
Heifers		
Av. weaning wt.:	439.8	431.4
Bulls	445.6	455.9
Heifers	433.2	410.0
Av. weaning type score:	11.6	11.1
Bulls	11.4	11.2
Heifers	11.7	11.1
Av. weaning condition score:	10.7	9.8
Bulls	10.4	9.6
Heifers	11.2	9.8

PERFORMANCE OF COW HERDS. 1958 CALVES
Georgia Coastal Plain Experiment Station

Line or group designation	Grade Angus	Grade P. H.	Gr. St. Ger.	Crisscross
Location	Reidsville			
Breed of sire	Angus	P. Hereford	S. G.	A ♂ H
Breed of dam	Angus	P. Hereford	S. G.	A x H
No. cows bred	25	25	24	25
No. cows calving	22	23	20	23
No. cows raised	19	22	18	23
Av. birth wt. (lbs):	58.9	65.7	72.9	63.2
Bulls	62.2	68.5	73.9	66.0
Heifers	53.4	57.8	71.3	57.9
Were calves creep fed?	No	No	No	No
Av. weaning date:	10/10/58	10/11/58	10/10/58	10/10/58
Bulls				
Steers (age + days)	243	244	237	228
Heifers (age-days)	244	241	219	246
Av. weaning wt.:	449	441	497	470
Bulls				
Steers	451	450	523	477
Heifers	446	414	466	458
Adjusted av. daily gain - birth to weaning	1.60	1.54	1.84	1.73
Av. weaning type score:	10.8	10.5	8.7	10.7
Bulls				
Steers	10.8	10.6	9.0	10.9
Heifers	10.8	10.5	8.4	10.4
Av. weaning condition score:	8.5	8.4	8.3	8.8
Bulls				
Steers	8.5	8.4	8.3	8.6
Heifers	8.6	8.5	8.3	9.3

PERFORMANCE OF COW HERDS. 1958 CALVES
Georgia Coastal Plain Experiment Station

Line or group designation	Crisscross	Crisscross	Rotational
Location	----------Reidsville, Georgia----------		
Breed or sire	A and S. G.	H and S. G.	A. H. and S. G.
Breed of dam	A x S. G.	H x S. G.	A x H, A x S. G. H x S. G.
No. cows bred	11	26	30
No. cows calving	11	28	28
No. cows raised	10	27	28
Av. birth weight (lbs):	61.6	67.3	67.9
Bulls	65.8	67.8	72.8
Heifers	58.2	59.7	63.6
Were calves creep fed?	No	No	No
Av. weaning date:	10/10/58	10/10/58	10/10/58
Bulls			
Steers (age-days)	226	237	234
Heifer	229	234	245
Av. weaning wt.:	456	470	512
Bulls			
Steers	503	521	537
Heifers	424	444	491
Adjusted av. daily gain - birth to weaning	1.72	1.72	1.84
Av. weaning type score:	10.2	9.8	9.8
Bulls			
Steers	10.3	9.5	10.0
Heifers	10.1	10.0	9.7
Av. weaning condition score:	8.8	8.9	9.0
Bulls			
Steers	8.6	8.7	9.0
Heifers	9.0	9.L	9.0

KENTUCKY STATION

-by-
N. W. Bradley, A. R. sons, and D. G. Steele

I. Project Title:

A performance and progeny testing program for bulls of the beef breeds. Anim. Husb. 260 (S-16)

II. Objectives:

To use rate of gain, efficiency of gain, conformation score and condition score of bull calves in an effort to determine the value these items should receive in predicting the future value of bulls in the breeding herd.

III. Accomplishments During the Year:

(a) Sixteen stalls with small outside paved lots are used twice each year to test a total of 32 bulls for rate of gain and efficiency of feed utilization. An additional 16 stalls are used for individually feeding the progeny of bulls which have completed the performance test. High gaining and low gaining bulls are bred to 20 grade Hereford and 20 pure-bred Red Poll cows. The Meats Laboratory at the University of Kentucky is available for collecting slaughter and carcass data.

(b) Two 154-day performance tests using a total of 31 bulls have been completed. The data from these tests are presented in tables 1 and 2. Another performance test using 15 bulls is underway at the present time.

(c) During the winter and spring of 1958, a total of 14 steers from 3 performance tested sires were fed for 112 days. Rate of gain and feed efficiency were determined and detailed slaughter and carcass data were collected. Of all the data which were analyzed statistically, only area of rib eye and color of lean were significantly different. The small number of progeny from each sire possibly accounted for other apparent differences not being significant. Additional performance data has been collected from 14 progeny, by 4 performance tested bulls, which are being fattened at the present time. These calves have been on a fattening ration for 183 days. They will be slaughtered after they have been fed for about 210 days and carcass evaluations will be made. The performance data which are available for the progeny of each of the 7 performance tested bulls are listed in table 3. In table 4, the sires are grouped according to high, medium and low gainers. When the data are presented in this manner, there are highly significant differences between sires for both feed lot gain and pounds per day of age for the progeny.

(d) A total of 75 calves from 6 different sires were dropped during the winter and early spring of 1958. The progeny from these 6 performance tested bulls was used to gather information on the effect of

sire on preweaning performance. These data are presented in table 5. The bulls were grouped into high, medium and low gainers on the basis of their pounds per day of age at the completion of the bull performance test. The average performance data are given in table 6 for the high, medium and low gaining groups of bulls. It is apparent that sire performance affected preweaning gains to a lesser extent than it did feed lot gains. However, it is realized that the numbers involved are rather small for a study of this kind.

(e) Each of two performance tested bulls were bred to an equal number of grade Hereford and purebred Red Poll cows at one outlying farm. The calves were dropped during the winter and early spring of 1958. At about 8 months of age, most of the calves were slaughtered and carcass data were collected. The performance and carcass data are presented in table 7. There are no real differences in the data for the progeny of the high-gaining and the low-gaining sires. It is quite possible that there is not enough difference in the gaining ability of sires to exert a marked difference in their offspring. It is also realized that differences in the milking ability of the cows could make it difficult to determine the effect of sire on calf gains while they are still nursing their dams. The Hereford and Red Poll cows are now being bred to bulls with a larger difference in their gaining ability. The cows have also been divided into breeding groups on the basis of their calves' previous gain.

IV. Future Plans:

(a) Two 154-day performance tests for young beef bulls will be conducted each year.

(b) A high gaining bull (average daily gain - 2.94 and pounds per day of age - 2.69) and a low gaining bull (average daily gain - 2.22 and pounds per day of age - 2.17) have each been bred to 10 Hereford cows and 10 Red Poll cows. A part of these calves will be slaughtered as milk-grass-fat calves and part of them will be fattened in the feed lot. Performance and carcass data will be collected on all the calves.

V. Publications:

Performance Testing of Beef Bulls by A. R. Parsons and D. G. Steele. Annual Livestock Field Day, University of Kentucky Animal Husbandry Mimeo. July 16, 1958.

Production Data and Carcass Characteristics of Beef Steers from Performance Tested Bulls, by Dana H. Saylor, M. S. Thesis, University of Kentucky. July 1958.

VI. Publications Planned:

Results will be published annually in the Kentucky Livestock Field Day Report and elsewhere as justified.

PERFORMANCE OF COW HERDS. 1958 CALVES
Kentucky Station

TABLE 1.

Location	Mercer	Mercer
Breed of sire	Hereford	Hereford
Breed of dam	Hereford	Red Poll
No. cows bred	17	20
No. cows calving	17	20
No. cows raised	17	20
Av. birth date	1/15/58	1/15/58
Av. birth wt. (lbs):		
Bulls	64	75
Heifers	60	65
Were calves creep fed?	8	11
Av. weaning date:		
Steers	9/27/58	9/27/58
Heifers	9/27/58	9/27/58
Av. weaning wt.:		
Steers	473	567
Heifers	431	504
Adjusted v. daily gain - birth to weaning	1.52	1.79
Calves slaughtered at weaning:		
1. Steer or bull calves		
No.	6	10
Average age (days)	238	233
Average weight (lbs.)	478	567
Av. dressing percent	53.05	57.54
Av. carcass grade	Standard +	Good
2. Heifer calves		
No.	7	10
Average age (days)	250	258
Average weight (lbs.)	442	504
Av. dressing per cent	54.47	56.63
Av. carcass grade	Good -	Good

KENTUCKY BEEF BULL PERFORMANCE TEST

TABLE 2.

	Angus	Here-ford	Short-horn	Angus	Here-ford	Short-horn	Charo-laise
Number	4	4	7	6	5	4	1
Av. initial age (days)	212	246	230	290	266	262	226
Av. initial wt. (lbs.)	489	544	492	578	435	580	740
Length Feed Period(das.)	154	154	154	154	154	154	154
Av. daily gain	2.00	2.15	2.34	2.07	2.73	2.38	2.50
Av. wt./age (days)	2.16	2.21	2.25	2.02	2.09	2.28	2.96
Av. type score:[1] initial	11.5	12.1	12.3	11.6	11.3	12.5	12.0
final	12.1	11.1	12.9	13.0	11.3	12.3	11.2
Av. cond. score:[1] initial	7.5	7.3	7.2	7.0	6.7	8.8	10.0
final	10.9	10.2	11.4	12.1	11.0	13.1	11.8
Feed per cwt/gain	786	750	748	829	640	848	806

[1]Grade code same as adopted by S-10 Technical Committee.

FEED LOT PERFORMANCE OF STEERS SIRED BY PERFORMANCE TESTED BULLS

TABLE 3.

		SIRE			PROGENY			
Bull No.	Year	Av. da. gain on Test	Lbs/day of age	Feed/cwt gain	No.	Feed lot av. da. gain	Lbs/day of age	Feed/cwt gain
363	1958	2.90	2.51	771	6	2.40	1.60	784
681	1958/9	2.55	2.40	749	3	1.95	1.77	969
668	1958/9	2.83	2.32	724	3	1.88	1.59	858
108	1958/9	2.46	2.28	878	4	1.92	1.74	844
510	1958	2.36	2.21	787	2	2.61	1.52	758
107	1958/9	2.22	2.17	828	4	1.90	1.65	764
514	1958	2.92	2.16	643	6	2.17	1.43	838

EFFECT OF HIGH, MEDIUM, AND LOW GAINING SIRES ON THE FEED LOT GAINS OF THEIR PROGENY

TABLE 4.

	SIRE			PROGENY		
	No. of bulls	Av. da. gain on test	Lbs/day of age	No.	Feed lot av. da. gain	Lbs/day of age
High Gainer	2	2.72	2.46	9	2.25	1.66
Medium Gainer	3	2.55	2.27	9	2.06	1.64
Low Gainer	2	2.57	2.16	10	2.06	1.52

PREWEANING PERFORMANCE OF CALVES SIRED BY PERFORMANCE TESTED BULLS

TABLE 5.

		SIRE		PROGENY		
Bull No.	Farm	Av. da. gain on test	Lbs/day of age	No.	Adjusted Av. da. gain	Lbs/day of age
363	Mercer	2.90	2.51	17	1.65	2.04
681	Mereworth	2.55	2.40	12	1.70	1.73
668	Mereworth	2.83	2.32	9	1.73	1.76
108	Mereworth	2.46	2.28	15	1.58	1.67
510	Mercer	2.36	2.21	12	1.68	1.98
107	Mereworth	2.22	2.17	10	1.63	1.62

EFFECT OF HIGH,MEDIUM, AND LOW GAINING SIRES ON THE PREWEANING GAINS OF THEIR PROGENY

TABLE 6.

	SIRE			PROGENY		
	No. of bulls	Av. da. gain on test	Lbs/day of age	No.	Preweaning av. da. gain	Lbs/day of age
High Gainer	2	2.72	2.46	29	1.67	1.91
Medium Gainer	2	2.64	2.30	24	1.64	1.70
Low Gainer	2	2.29	2.19	22	1.65	1.82

GAINS AND CARCASS CHARACTERISTICS OF MILK-GRASS-FAT CALVES SIRED BY HIGH AND LOW GAINING BULLS

TABLE 7.

	High Gaining[1] Sire	Low Gaining[2] Sire
Number of calves	17	12
Average daily gain	1.65	1.67
Pounds per day of age	2.04	1.98
Carcass wt/day of age	1.10	1.09
Carcass grade	Good	Good-
Fatness of rib, mm.	9.20	7.92
Area of rib eye, sq. in	6.90	6.93
Color of lean[3]	A-3.1	A-3.2
Color of fat[4]	2.3	2.3

1 Average daily gain on bull performance test - 2.90
Pounds per day of age at the end of performance test - 2.51

2 Average daily gain on bull performance test - 2.36
Pounds per day of age at end of performance test - 2.21

3 One cell color paddle score - the lower the number the lighter the color

4 1 = Creamy white
2 = Yellowish tinge
3 = Yellow

LOUISIANA STATION

-by-
S. H. Fo[illegible]er, S. E. McCraine, R. M. Crown,
A. M. Mullins and R. A. Damon, Jr.*

I. Project Title:

Comparison of Various Crossbred Cattle Under Gulf Coast Conditions with Respect to Rate of Growth on Pasture, Fattening Ability, and Meat Quality of Steers. Anim. Indus. 605 (S-10)

II. Objectives:

(a) To develop types of beef cattle best suited to conditions along the Gulf Coast.

(b) To compare the performance of several breeds of beef cattle and crosses between these breeds with respect to rate of growth on pasture, fattening ability, and meat quality of steers.

(c) To estimate the amount of hybrid vigor that can be expected to result from crossing beef breeds and to ascertain the methods best suited for its utilization and maintenance.

III. Accomplishments During the Year:

(a) Facilities and cattle required:

An extensive crossbreeding project was initiated in 1952. Six breeding herds of 32 cows each were established. Each herd was composed of 8 Angus, 8 Brahman, 8 Brangus, and 8 Hereford cows. The herds were mated to bulls of six different breeds: Angus, Brahman, Brangus, Hereford, Shorthorn, and Charolais. Thus, 24 different types of cattle were produced--4 purebreds and 20 crossbreds.

The breeding program was broken down into three phases: (1) first-crosses, (2) backcrosses, and (3) three-breed crosses.

Five crops of first-cross calves were produced, and first-cross cows now make up the six backcross breeding herds. The second crops of backcross calves is currently on the ground (May 1959).

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*Dr. Damon, former project leader, is now with U.S.D.A., A.R.S., Biometrical Services, Agricultural Research Center, Beltsville, Maryland.

Appreciation is expressed to Mr. T. E. Spillman and Mrs. Dorothy C. Wilson for valuable contributions in management of the herds and maintenance of extensive records, respectively.

Appreciation is also expressed to Dr. Ralph F. Boulware for his assistance in securing much of the carcass data.

The project now utilizes some 750 acres of land at the Main Experiment Station, Baton Rouge; and there are approximately 700 animals currently assigned to the project. A new meats research laboratory was placed in operation during the year; this will aid in the collection of organoleptic data.

(b) Research results:

Birth dates, birth weights, and weaning weights are secured on all calves. Sale value is evaluated at weaning time by a three-man grading committee. Slaughter and feeder grades are assigned to all steers and heifers, and heifers are also graded as breeders.

All females produced are retained for further breeding studies in connection with this crossbreeding project.

Steer calves are fed for 168 days after weaning on wheat and rye grass pasture with a limited supplement of corn and cottonseed meal. Rate of gain data are obtained, and the yearling steers are graded prior to slaughter. The steers are slaughtered in the University's meats laboratory. Carcass grades, rib-eye areas, and shearing strength data are among the important carcass information obtained.

Starting with the backcross phase of the project, photographs are secured of representative animals of the various breeds and crosses. Pictures are secured of the animals behind a photographic grid at weaning. Steers are re-photographed behind the grid just prior to slaughter, and photographs are secured of their carcasses.

Organoleptic data are being secured on the backcross calves now that facilities of the new meats research laboratory are available. The first crop of backcross steers have been slaughtered, but data are not ready for reporting at this time.

Data on the first-cross calves have been summarized, and the information on weaning weights and slaughter calf grades was reported in the February, 1959 issue of the Journal of Animal Science. It was found that Brangus and Brahman females raise calves that are not only heavier at weaning but also grade higher. The heaviest weaning weights are generally reached with the use of Charolais, Hereford, and Shorthorn bulls on the Brangus and Brahman cows. Although Charolais bulls have sired the heaviest calves, the slaughter calf grades of these calves are lowered because of their lack of finish. Crosses among Brahman and other breeds of cattle have shown a considerable advantage over the pure breeds with respect to weaning weights, although the advantage is not so marked when slaughter calf grades are considered. These crosses are generally superior when the Brahman breeding is in the females. The data indicate that little or no advantage is to be gained in weaning weights by crossing the English beef breeds under the conditions of this experiment.

A second paper has been completed and a third is in preparation to present the remainder of the information from the first-cross phase of the project. The 1958 Report of the Annual Meeting of the S-10 Technical Committee carries a report of several of the traits under study in the first-cross animals. Similar presentation is made at the end of this report for planimeter readings of the longissimus dorsi muscle and shearing strength of meat from the first-cross steers. The shearing values were obtained with a Warner-Bratzler Shear, using a one-inch core. The 9-10-11 rib was cooked to an internal temperature of 59° C., and samples were taken from the lateral, central, and medial locations in the rib-eye area at each of the three ribs. Two readings were secured for each core for a total of 18 readings per animal.

Considerable valuable information is accumulating as to which types of cattle are most desirable for beef production under Gulf Coast conditions. Positive conclusions cannot be made, however, until the third phase of the project is completed. When all data are completed, they must be interpreted in terms of the future trends in type of production in the South (that is, slaughter calf production versus feeder calf production and feed-lot operations). Choice of breeds and planning of breeding programs should also give consideration to current and prospective changes in marketing and meat processing (such as, changes in grade standards, use of tenderizers, prefabricated cuts, etc.).

IV. Future Plans:

One or two additional backcross calf crops will be produced before the project moves into its third phase, which will study three-breed crosses. If sufficient land and facilities become available, it is planned to test the dam performance of the backcross females produced in the second phase and also the three-breed females produced in the third phase. Some consideration is also being given to the desirability of introducing some Devon and Brown Swiss breeding into the study.

Robert S. Temple, now at Iowa State College, will join the Animal Industry staff in June and will become Project Leader at that time.

V. Other Projects:

In addition to Project 605, a project concerned with the investigation of the inheritance and effects of "double-muscled" condition in beef cattle is underway. The size of the breeding herd has been expanded, and considerable data have been collected. A manuscript will be prepared as soon as the analysis of the data will permit.

VI. Publications:

Damon, R. A., Jr., S. E.McCraine, R. M. Crown, and C. B. Singletary. 1959. Performance of Crossbred Beef Cattle in the Gulf Coast Region. Journal of Animal Science 18:437-447.

Damon, R. A., Jr., S. E. McCraine, R. M. Crown, and C. B. Singletary. Gains and Grades of Beef Steers in the Gulf Coast Region. Manuscript accepted for publication in Journal of Animal Science.

SUMMARY OF CERTAIN CARCASS DATA
(275 Steers on Postweaning Performance Test)

Breed of dam	Breed of sire: Angus	Hereford	Shorthorn	Brangus	Brahman	Charolaise	Averaged by breed of dam
			Warner-Bratzler Shearing Strength				
Angus	13.9	16.2	13.8	18.5	14.3	16.0	15.4
Hereford	12.9	13.3	13.6	16.3	13.4	14.0	13.9
Brangus	13.6	13.9	13.5	16.1	16.9	14.6	14.8
Brahman	16.0	14.2	16.6	16.8	20.7	16.4	16.8
Averaged by breed of sire	14.1	14.4	14.4	16.9	16.4	15.3	15.2
			Area of Rib Eye (sq. in.)				
Angus	8.86	8.79	8.37	8.92	8.53	9.54	8.83
Hereford	8.61	8.87	8.02	8.52	8.59	9.21	8.63
Brangus	9.13	8.78	8.18	9.27	8.61	9.14	8.85
Brahman	8.53	8.20	7.79	9.24	8.12	9.23	8.52
Averaged by breed of sire	8.788	8.66	8.09	8.98	8.46	9.28	8.71

La

POSTWEANING PERFORMANCE OF 1957 STEER CALVES
Fed on Pasture and Concentrate Supplement
Baton Rouge, Louisiana

	Angus Crossbreds	Brahman Crossbreds	Brangus Crossbreds	Charolaise Crossbreds	Hereford Crossbreds	Shorthorn Crossbreds
No. Steers	11	7	9	9	11	14
Feeder Grade[1]	10.70	10.90	8.15	11.07	12.45	9.89
Slaughter Calf Grade[2]	9.64	10.24	8.48	9.74	10.60	8.78
Slaughter Grade[2]	9.15	8.98	9.15	8.96	10.06	9.22
Av. Daily Gain on Feed	1.45	1.38	1.58	1.43	1.67	1.54
Carcass Grade[2]	8.73	7.52	8.63	6.85	9.24	8.33
Hot Dressing Percentage	56.30	58.05	57.21	57.10	57.10	57.94
Chilled Dressing Percentage	55.10	56.75	56.00	56.11	55.96	58.21
Planimeter Area Eye of Lean	7.14	8.22	8.02	8.49	8.54	7.46
Shearing Strength Tenderness	20.69	23.19	22.01	18.20	17.34	24.60

[1] Common 3-5, Medium 6-8, Good 9-11, Choice 12-14, Fancy 15-17.

[2] Utility 0-2, Commercial 3-5, Standard 6-8, Good 9-11, Choice 12-14, Prime 15-17.

La

PERFORMANCE OF COW HERDS. 1958 CALVES
Baton Rouge, Louisiana

Location	Baton Rouge, Louisiana					
Breed of sire	Angus	Angus	Angus	Angus	Brahman	Brahman
Breed of dam	An x BA	Angus	An x Her	An x B	B x Ba	B X A
No. cows bred	8	8	8	5	8	5
No. cows calving	3	4	5	3	8	5
No. cows raised	3	4	5	3	7	4
Av. birth date	2/18/58	2/6/58	1/23/58	1/20/58	2/17/58	2/9/58
Av. birth wt. (lbs):	68.0	64.5	57.0	58.0	64.4	66.6
Bulls	66.5	69.0	49.0		66.0	70.7
Heifers	71.0	51.0	59.0	58.0	62.3	60.5
Were calves creep fed?	No	No	No	No	No	No
Av. weaning date:	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58
Bulls						
Steers	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58
Heifers	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58
Av. weaning wt.:	388.3	366.2	402.0	466.7	441.4	473.8
Bulls						
Steers	420.0	380.0	420.0		467.5	462.5
Heifers	325.0	325.0	397.5	466.7	406.7	485.0
Adjusted av. daily gain - birth to weaning*	1.34	1.20	1.30	1.52	1.58	1.65
Av. weaning type score:	H-Good	L-Good	Good	L-Choice	H-Good	L-Choice
Bulls						
Steers	H-Good	L-Good	H-Good		H-Good	L-Choice
Heifers	L-Good	L-Good	Good	L-Choice	H-Good	Choice
Av. weaning condition score:	L-Good	H-Stan	L-Good	L-Choice	Good	H-Good
Bulls						
Steers	Good	H-Stan	Good		Good	H-Good
Heifers	H-Stan	L-Good	L-Good	L-Choice	Good	L-Good
Adjusted 180-day weight**	339.7	318.5	341.6	376.3	385.0	403.5

* Adjusted av. daily gain - birth to weaning -- not adjusted.

** 180-day weights - adjusted for age of cow and sex of calf.

La

PERFORMANCE OF COW HERDS. 1958 CALVES

Location	Baton Rouge, Louisiana					
Breed of Sire	Brahman	Brahman	Brangus	Brangus	Brangus	Brangus
Breed of dam	B x Her	Brahman	Brangus	BA x A	BA x Her	BA x B
No. cows bred	8	8	8	8	8	8
No. cows calving	8***	7	3***	3	5	0
No. cows raised	6	4	1	2	5	
Av. birth date	2/15/58	2/25/58	1/29/58	3/13/58	3/20/58	
Av. birth wt. (lbs):	68.9	58.0	64.5	64.3	73.2	
Bulls	70.7	63.6	64.5	74.0	76.0	
Heifers	67.5	44.0		59.5	71.3	
Were calves creep fed?	No	No	No	No	No	
Av. weaning date:	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	
Bulls						
Steers	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	
Heifers	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	
Av. weaning wt.:	468.3	367.5	530.0	435.0	463.0	
Bulls						
Steers	472.5	393.3	530.0	460.0	457.5	
Heifers	466.2	290.0		410.0	466.7	
Adjusted av. daily gain - birth to weaning*	1.67	1.42	1.79	1.34	1.37	
Av. weaning type score:	L-Choice	H-Good	L-Choice	L-Choice	L-Choice	
Bulls						
Steers	L-Choice	H-Good	L-Choice	H-Good	L-Choice	
Heifers	L-Choice	L-Good		L-Choice	L-Choice	
Av. weaning condition score:	H-Good	L-Good	H-Good	H-Good	H-Good	
Bulls						
Steers	H-Good	Good	H-Good	Good	H-Good	
Heifers	H-Good	H-Stan		H-Good	H-Good	
Adjusted 180-day weight**	411.5	353.2	398.0	421.0	440.2	

* Av. daily gain - birth to weaning -- not adjusted.

** 180-day weights - adjusted for age of cow and sex of calf.

*** One calf in this group not sired by herd bull.

PERFORMANCE OF COW HERDS. 1958 CALVES

Location	Baton Rouge, Louisiana					
Breed of sire	Charolaise	Charolaise	Charolaise	Charolaise	Hereford	Hereford
Breed of dam	Ch x BA	Ch x An	Ch x Her	Ch x B	Her x BA	Her x An
No. cows bred	8	8	5	7	8	8
No. cows calving	2***	4	1	4	7	6
No. cows raised	1	4	1	4	6	6
Av. birth date	4/29/58	3/17/58	3/3/58	4/5/58	2/8/58	2/2/58
Av. birth wt. (lbs):	92.0	81.3	92.0	94.0	64.4	69.5
Bulls	92.0	79.7	92.0	92.0	66.3	71.4
Heifers	-	88.0		96.0	63.0	60.0
Were calves creep fed?	No	No	No	No	No	No
Av. weaning date:	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58
Bulls						
Steers	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58
Heifers	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58
Av. weaning wt.:	420.0	470.0	440.0	527.5	466.7	423.3
Bulls						
Steers	420.0	471.7	440.0	507.5	451.7	422.0
Heifers		465.0		547.5	481.7	430.0
Adjusted av. daily gain - birth to weaning*	1.93	1.82	1.53	2.24	1.63	1.40
Av. weaning type score	L-Choice	L-Choice	H-Good	L-Choice	H-Good	H-Good
Bulls						
Steers	L-Choice	L-Choice	H-Good	L-Choice	H-Good	H-Good
Heifers		Choice		Choice	L-Choice	Choice
Av. weaning condition score:	H-Good	Good	Good	Good	Good	Good
Bulls						
Steers	H-Good	Good	Good	L-Good	Good	Good
Heifers		H-Good		H-Good	H-Good	H-Good
Adjusted 180-day weight**	461.0	435.2	378.0	529.5	397.5	347.2

* Av. daily gain - birth to weaning -- not adjusted.

** 180-day weights - adjusted for age of cow and sex of calf.

*** One calf in this group not sired by herd bull.

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PERFORMANCE OF COW HERDS. 1958 CALVES

Location	Baton Rouge, Louisiana					
Breed of sire	Hereford	Hereford	Shorthorn	Shorthorn	Shorthorn	Shorthorn
Breed of dam	Hereford	Her x B	Sh x BA	Sh x An	Sh x Her	Sh x B
No. cows bred	8	8	5	7	8	8
No. cows calving	7	6	5	5	7	7
No. cows raised	5	6	5	4	6	7
Av. birth date	2/6/58	2/11/58	1/27/58	1/22/58	1/22/58	1/30/58
Av. birth wt. (lbs):	64.9	62.2	66.0	50.0	57.3	62.9
Bulls	65.6	65.8	72.5	51.3	58.7	59.0
Heifers	62.5	55.0	61.7	48.0	56.2	64.4
Were calves creep fed?	No	No	No	No	No	No
Av. weaning date:	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58
Bulls			10/16/58	10/16/58	10/16/58	10/16/58
Steers	10/16/58	10/16/58	10/16/58	10/16/58		
Heifers	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58
Av. weaning wt.:	396.0	516.7	445.0	362.5	361.8	468.6
Bulls						
Steers	413.3	560.0	442.5	400.0	355.0	485.0
Heifers	370.0	430.0	446.(	325.0	365.0	462.0
Adjusted av. daily gain - birth to weaning*	1.33	1.85	1.47	1.13	1.13	1.59
Av. weaning type score:	H-Good	Choice	H-Good	Good	H-Good	Choice
Bulls						
Steers	H-Good	L-Choice	H-Good	Good	H-Good	L-Choice
Heifers	Good	Choice	L-Choice	Good	H-Good	Choice
Av. weaning condition score:	L-Good	L-Choice	Good	H-Stan	Good	H-Good
Bulls						
Steers	L-Good	L-Choice	Good	L-Good	L-Good	H-Good
Heifers	L-Good	L-Choice	H-Good	H-Stan	Good	L-Choice
180 day-weights**	338.4	426.2	350.0	310.0	311.3	397.9

* Av. daily gain - birth to weaning -- not adjusted.

** 180-day weights - adjusted for age of cow and sex of a

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JEANERETTE STATION
-by-
T. M. DeRouen

I. Project Title:

The Development of Pure and Crossbred Types of Cattle for Southeastern United States and the Gulf Coast Region. (S-10) Coop. ARS.

II. Objectives:

To evaluate strains of Brahman-Angus and Afrikander-Angus in comparison with straight Brahman; Aberdeen-Angus and first crosses of these purebreds with respect to the utilization of grasses, roughages, and other feeds in the production of beef.

III. Accomplishments During the Year:

A. Routine procedures were followed in obtaining performance data during the year. Six lines of Brahman-Angus, four lines of Afrikander-Angus, a Brahman herd and an Aberdeen-Angus herd were used in obtaining the data.

Six Sindhi cows were transferred from the Dairy unit to the Beef unit in 1956. These cows are being used in pilot tests to determine the possibility of these animals for beef production and to increase milk flow of the Brahman cattle at the Station. From the Sindhi cows transferred to the Beef unit, only one steer was produced, that could be compared to the other animals.

A total of 259 cows were bred in the spring of 1956 and 165 calves were raised. No creep feeding was practiced.

All females exposed to bulls during the spring breeding season are rectally palpated in early fall to determine pregnancy and to improve breeding efficiency. The breeding season begins about April 1 and ends about June 15.

It was observed that the Brahman-Angus lines produced heavier calves at six months and at weaning. This is reflected in a higher average type and condition score. The accompanying table gives some of the results obtained on the performance of the cow herd.

B. On October 22, 1957, after weaning, thirty bull calves were placed on a gain-feed efficiency test for 154 days. No Angus bulls were on test in 1957-58. Twenty of the bulls were fed out in individual pens and ten were group fed because of a shortage of individual pens. The Brahman-Angus bulls had the highest type score at the beginning of the test and the Brahman bulls had the highest type score at the end of the test. There was very little difference in the rate of gain among the three groups fed out this year. The following table gives some of the post-weaning performance information on the bulls.

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C. Forty Record of Performance steers were studied for gain, feed efficiency, carcass evaluation and palatability test. The steers were roughed through their first winter on cottonseed meal and salt mixed in proportion of three parts of cottonseed meal and one part of salt by weight. They also received a limited quantity of grass silage, hay and in late winter, were put on winter oat pasture. Beginning on April 16, 1958 when the steers were approximately 14 months old, they were placed on full-feed on pasture for 140 days. Some of the data collected on the steers are presented in the tables on "Post Weaning Performance of 1957 Calves Full Fed After Weaning" and on "Carcass Data of 1957 Steers."

D. Losses from Anaplasmosis were very severe among commercial cattlemen in this locality in 1958.

The entire herd on the Station is bled in the spring and autumn to determine the number of carrier animals. Results of the test of the spring bleeding indicated that 13% of the beef animals were reactors or suspicious to the test or potential carriers of the disease. The fall bleeding showed that 42% of animals were positive or suspicious to the test. In spite of this tremendous increase in positive reactors, only four clinical cases of the disease were observed and treated. All four recovered, except one Brahman bull, that apparently had the disease and after a few weeks, died suddenly. He was posted. It appeared that he died of a nail puncture of the paunch and laceration of the liver. No anaplasma bodies could be found in the post-morten examination, however, it was stated that the animal appeared to have recovered from the disease, although Anaplasmosis may have been a contributing factor to his death.

E. Eight yearling Aberdeen-Angus heifers were purchased to increase the number of females of that herd.

F. Analyses of heat tolerance data at the Iberia Livestock Experiment Farm, Jeanerette, Louisiana, for the years 1942 to 1951 inclusive showed highly significant correlations between respiration rates and body temperatures in beef cattle. Correlations for crossbred cattle ranged from approximately 0.5 to 0.6. These correlations are not considered sufficiently high to justify the interchangeable use of respiration rates and body temperatures as a measure of heat tolerance.

Correlations between dam's coefficient of heat tolerance and production as measured by her own weight at birth, 6 months and 5 years, and those of her progeny at the same ages were not statistically significant and were numerically too low to have much predictive value. In general the same was true when respiration rates were used instead of heat tolerance coefficients.

As a consequence of these findings, use of heat tolerance ratings as aids to selections in cattle at the Iberia Livestock Experiment Farm has been discontinued. Apparently selection on the basis of production automatically includes sufficient selection for necessary heat tolerance.

IV. Future Plans:

A. To continue to evaluate strains of Brahman-Angus, Afrikander-Angus in comparison with Brahman; Angus and first crosses of these purebreds.

B. Reciprocal first cross matings between Angus and Brahman were made in 1958 and the crossbreds are to be compared with the Brahman-Angus lines, Angus and Brahmans. A small herd of first cross Angus-Brahman and Brahman-Angus females will be established. The male progeny of these matings will be castrated at weaning and fed out under R O P procedures along with steers from the other herds. Females of these matings will not be used for further breeding studies.

C. To evaluate Sindhi cows for the production of beef, under conditions at the Jeanerette Station, by breeding them to Angus and Brahman bulls.

V. Publications During the Year:

Vernon, E. H., R. A. Damon, Jr., W. R. Harvey, E. J. Warwick and C. M. Kincaid. Relation of Heat Tolerance Determinations to Productivity in Beef Cattle. Jour. An. Sci. 18:91-94.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)
Iberia Livestock Experiment Station

Line or group designation	Bra-Angus	Afri-Angus	Brahman	Angus	Sind-Brah
Location		Jeanerette, Louisiana			
Breeding of calves	Bra-Angus	Afri-Angus	Brahman	Angus	Sind-Brah
Av. inbreeding (%)	4.06	9.21			
Bulls, No.	20	8	2		
Av. inbreeding(%)	6.72	10.28			
Av. weaning wt. (lbs)	509	489	480		
Av. initial age (days)	255	267	258		
Av. initial wt. (lbs)	536	501	480		
Length of feeding period (days)	154	154	154		
Av. daily gain (lbs)	2.42	2.51	2.44		
Av. type end test [a]	10.6	10.8	11.8		
Feed per cwt. gain (lbs)	840	832	770		
Concentrates	630	624	578		
Roughage	210	208	192		
Steers, No.	15	12	9	3	1
Av. inbreeding (%)	9.58	11.72			
Av. weaning wt. (lbs)	426	408	399	345	415
Av. initial age (days)	422	436	430	380	447
Av. initial wt. (lbs)	599	588	526	520	570
Length of feeding period (days)	140	140	140	140	140
Av. daily gain (lbs)	1.90	1.60	1.77	1.74	2.0
Av. type score end test	8.7	8.7	10.7	7.8	9.3
Feed per cwt. gain (lbs)[c]	1022	1022	1022	1022	1022
Concentrates	766	766	766	766	766
Roughage	256	256	256	256	256

[a] Ration consisted of:- 500 lbs. allyce clover, 1200lb corn, 300 lb cottomseed meal
[b] Fancy 15-17, choice 12-14, good 9-11, medium 6-8, common 3- .
[c] Steers started on feed test at approximately 14 months old.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1958
Iberia Livestock Experiment Station

Line or group designation	Bra-Angus	Afri-Angus	Brahman	Angus	Sind-Brah
Location	Jeanerette, Louisiana				
Breeding:	Bra-Angus	Afri-Angus	Brahman	Angus	Sind-Brah
Sex:	Steer	Steer	Steer	Steer	Steer
No.	15	12	9	3	1
Av. age (fall 1957) (days) 10/2/57	226	240	234	184	251
Av. wt. (fall 1957) (lbs) 10/2/57	426	408	399	345	415
Days on pasture*	196	196	196	196	196
Av. wt. spring 4/16/58	599	588	526	520	570
Av. gain on pasture (lbs)	173	180	127	175	155
Av. daily gain on pasture (lbs	0.88	0.92	0.65	0.89	0.79
Days on feed*					
Av. wt. 9/3/58 (lbs)	855	813	773	763	860
Av. daily ration-consumed	17.7	17.7	17.7	17.7	17.7
Av. gain on feed	266	225	247	243	290
Feed/cwt/gain lbs	1022	1022	1022	1022	1022
Av. daily gain on feed (lbs)	1.90	1.61	1.76	1.74	2.07
Animals slaughtered:	15	12	9	3	1
Averages at slaughter					
Age - days	562	576	570	520	587
Weight - lbs	822	779	731	727	795
Live shrink (truck 106 mi)					
Lbs	33	34	42	36	65
Live grade	8.7	8.7	7.8	10.7	9.3
Dressing % - chilled	58.6	59.2	59.4	59.3	60.1
Carcass grade	8.0	8.3	8.0	10.0	9.0

* Steers were roughed through winter on mixture of cottonseed meal and salt (3 parts meal and 1 part salt by weight) on pasture. In late winter, steers received grass silage, hay and were put on oat pasture. Beginning April 16, 1958, all steers were placed on full feed (concentrates) on pasture for 140 days. Ration consisted of: Corn - 1200 lbs., Cottonseed meal - 300 lbs., Allyce clover hay 500 lbs.

CARCASS DATA OF 1957 STEERS
(Fed in 1958)

Line or group designation	Brah-Angus	Afric-Angus	Angus	Brahman	Sind-Brah
Location	Jeanerette, Louisiana				
Breed of sire	Brah-Angus	Afric-Angus	Angus	Brahman	Brahman
Breed of dam	Brah-Angus	Afric-Angus	Angus	Brahman	Sindhi
No. of steers	15	12	3	9	1
Length of feeding period (days)	140	140	140	140	140
Carcass grade[a]	8.0	8.3	10.0	8.0	9.0
Carcass weight - warm	491	469	439	442	487
Carcass weight - chilled[b]	482	461	431	434	478
Chilled dressing percent	58.6	59.2	59.3	59.4	60.1
Rib eye area - sq. inches	9.86	9.72	8.15	8.16	9.80
Shear value - tenderness	19.39	16.78	12.38	30.03	20.13
Physical separation - 9, 10, 11, rib					
Lean - %	52.91	56.10	47.91	54.75	51.83
Fat - %	28.83	25.60	34.88	25.98	31.71
Bone - %	18.26	18.30	17.22	19.27	16.46
Palatability score (12th rib)	6.76	7.22	7.35	6.22	6.39
Ether Extract (12th rib)	2.52	1.52	3.38	1.98	2.00

[a] Utility 3-5, commercial 6-8, good 9-11, choice 12-14, prime 15-17.

[b] 1.8% figure used by Swift & Co., Lake Charles, Louisiana, to calculate chilled shrink of warm carcass.

PERFORMANCE OF COW HERDS. 1958 CALVES
Iberia Livestock Experiment Station

Line or group designation	Bra-Angus	Afri-Angus	Brahman	Angus	Sindhi
Location	Jeanerette, Louisiana				
Breed of sire	Bra-Angus	Afri-Angus	Brahman	Angus	Brahman
Breed of dam	Bra-Angus	Afri-Angus	Brahman	Angus	Sindhi
No. cows bred	140	63	33	28	10
No. cows calving	97	55	31	27	10
No. calves raised	70	43	13	11	6
Av. inbr. of dams (%)	4.27	9.64			
Av. inbr. of calves(%)	7.74	12.91			
Av. birth date	2/9/58	2/5/58	2/21/58	1/28/58	1/26/58
Av. birth wt. (lbs):					
Bulls	59	59	66	60	67
Heifers	58	52	61	52	57
Were calves creep fed?	No	No	No	No	No
Av. weaning date:	9/30/58	9/30/58	9/30/58	9/30/58	9/30/58
Bulls					
Steers					
Heifers					
Av. weaning wt.:					
Bulls	481	436	448	430	590
Steers	379	355	438	352	438
Heifers	408	369	423	375	422
Adjusted av. daily gain - birth to weaning	1.57	1.36	1.66	1.37	1.70
Av. weaning type score:					
Bulls	9.7	8.9	9.6	10.8	10.0
Steers	7.3	6.9	8.0	7.9	9.0
Heifers	8.9	7.8	9.1	9.2	9.9
Av. weaning condition score:					
Bulls	8.9	7.7	8.7	9.2	9.0
Steers	6.6	6.4	7.9	7.1	9.1
Heifers	8.1	7.3	8.7	8.5	9.2

Md

MARYLAND STATION
-by-
W. W. Green

I. Project Title:

A Study of Productiveness of Purebred Beef Cattle in Maryland. Anim. Husb. C-14 (S-10)

II. Objectives:

(1) To study productiveness of existing or introduced stocks of beef cattle. Productive characteristics measured will include rate of gain, economy of gain, market type, carcass quality, fertility, longevity, adaptation to environmental conditions, and other factors affecting the utility value of beef cattle.

(2) To compare selective criteria (individual and pedigree) with actual performance of progeny.

(3) To evaluate breeding techniques for small purebred herds under the varying conditions encountered in practice in purebred herds.

(4) To attempt to produce beef cattle with superior productive capacities by line breeding and selection. (Using criteria of selection as developed in this project and by cooperating stations in this and other regions.)

III. Accomplishments During the Year:

Weights and measurements requested by the S-10 Committee were taken on all cattle at the ages of 6, 12, 24, and 48 months.

Weaning weights were obtained for 56 bull and 52 heifer calves in the herd of a cooperator. A total of 57 bull calves were fed on gain-test trials at the farm of the cooperator and 5 of his calves were fed at a feeding station in Oklahoma.

The results of the Maryland Beef Improvement Program were summarized for each of the years 1957 and 1958 in connection with objective (1) of this project. Weaning weights and scores were the data studied.

IV. Future Plans:

Cooperation with the above mentioned herd will be continued as will be the taking of the measurements on the cattle of the University. The latter data will be accumulated with the past data for probable use in a future study. Preparation of future summaries for the Maryland Beef Cattle Improvement Program is problematical.

V. Publications During the Year: Md

Green, W. W. and B. T. Whittle (1958). Maryland beef cattle improvement program- Summary, 1957. Univ. Md. Dept. Anim. Husb. Mimeo. A. H. 58-2. pp 8.

Green, W. W. and B. T. Whittle (1959). Maryland beef cattle improvement program- Summary, 1958. Univ. Md. Agric. Expt. Sta. Misc. Pub. 334. Dept. Anim. Husb. Mimeo. A.H. 59-1. pp 12.

VI. Publications Planned:

None, with the possible exception of a Summary for 1959 of the M.B.C.I.P. data.

I. Project Title:

Effect of Early Weaning on the Duration of Maternal Influences in Beef Calves. Anim. Husb. Sub-project C-14-a (S-10)

II. Objectives:

(1) To attempt to develop a new technique for an earlier evaluation of feed lot performance, progeny testing, and genetic evaluation of beef animals.

(2) To develop sound feeding and management practices for early weaned beef calves.

(3) To evaluate the calves' genetic ability to thrive under new systems of care.

III. Accomplishments During the Year:

The work has been of the nature of a series of problems the objective of which was to study additional associations among the variables.

Average weights (X_2), gains (X_1), and TDN consumption (Y) for age periods of 174-230, 174-258, 174-286, 174-314, and 174-342 days were inter-correlated and the usual zero order, multiple, and partial regression coefficients and beta and partial regression coefficients were calculated for the data of the heifers and also steers weaned at 90 days of age. The $R_{y.x_1x_2}$ coefficients increased from 0.8 to 0.9 during the successive age periods but were not much higher in magnitude than the r_{x_2y} coefficients. The values of $r_{yx_1.x_2}$ were about one-half those of the $r_{yx_2.x_1}$; approximately 0.3 : 0.6. The $R_{y.x_1x_2}$ values in this study were about 0.1 larger than the $R_{y.x_1x_2}$ coefficients found when the data of the individual 28-day periods were used. All calculations were based on the "residual" line of a covariance type of analysis.

Md In a second study, data from series of successive 28-day periods were combined, each observation for each calf for each 28-day period being considered as a separate item in the data such that N would equal the number of calves per group X the number of 28-day periods involved. The age periods were: 90-118 through 174-202, and 90-118 through 342-370 days for the heifers and steers weaned at 90 days of age and 202-230 through 342-370 days for both heifers and steers weaned at 90 or 180 days of age. The statistics mentioned above were calculated from this data. Relative to each period indicated and to each weaning age and sex group or combinations of groups, $R_{y.x_1x_2}$ was numerically very close to r_{yx2}. This result as well as many other results found during the progress of work on this project tend to indicate the importance of "Maintenance" relative to the use of T.D.N. and to the inadvisability of using the usual ratio, TDN/lb. gain, which is used so frequently in calculating the economy of gains.

Inasmuch as all data and results reported to date have been on the basis of an age-constant population, the above types of statistics were calculated from best estimates of age (X_3), gain (X_1), and TDN (Y) during a 28-day period when the calves were either 300 or 500 pounds in weight. Calculations were made for each weaning age and sex group as well as combinations of sex groups within age periods. In general, $r_{yx_3.x_1}$ coefficients were equal to or smaller then, mostly smaller, than r_{yx2} coefficients; a similar situation was found in respect to the $R_{y.x_3x_1}$ and $R_{y.x_2x_1}$, indicating that weight might be a more important factor in causing variation in TDN consumption than age.

Studies were made to test the rectilinearality of association between gain and TDN and average weight and TDN, mainly for the age periods of 90-202 and 202-370 days. Significant departure from rectilinearity was not found.

A series of studies involving the completion of correlation surfaces showing the relationships of average weight, gain, or TDN consumption/body weight raised to various powers has been initiated in order to explore further the validity of using $W^{.7}$ as an estimate of maintenance requirements. Results to date indicate that the values of $W^{.x}$ previously reported may be of more value for growing animals than the $W^{.7}$ or $W^{.75}$ previously used by some workers.

Heritability studies have also been initiated, recognizing that the amount of data is limited.

Intercorrelations among measurements of calves taken at 90, 180, and 370 days of age and correlations between measurements taken at one age with those at other ages have been completed with the cooperation of U.S.D.A., A.R.S. Biometrical Services. Gains and TDN consumptions were also included as variables. Calculations were based on within sex and year. A total of 54 items and 8 matrices are involved. Tests for significance between correlations of the two age periods has been completed.

IV. Future Plans: Md

The main work relative to the data from the individually fed calves will be to complete analyses now underway and to work on a manuscript now started. The measurement data will be studied further, calculating simple correlation coefficients from data involving ratios of measurements and also the calculation of multiple correlations.

V. Publications During the Year:

The manuscript "Requirements for growth and maintenance of beef calves" by W. W. Green, W. J. Corbett and J. Buric has been revised slightly and re-titled "Comparison of methods for estimating the feed used for growth and maintenance of beef calves". This has been accepted for publication in the Journal of Animal Science and the galley has been proofread and returned to the editor.

VI. Publications Planned:

Completion of a manuscript covering the results from the individual feeding trial will be accomplished as soon as possible.

I. Project Title:

Group versus Individual Feeding of Weaned Beef Calves. Anim. Husb. AH-C-14-D (S-10)

II. Objectives:

(1) To evaluate the accuracy of group vs. individually fed calves as a technique in the testing of sire-progeny groups.

(2) To study the possibility of forecasting the productiveness of beef calves by using single or combined measurements taken on live animals.

(3) To study the value of scores taken on live animals in relation to forecasting their performance.

(4) To compare measurements and scores in order to search for objective methods of determining scores.

(5) To study absolute and relative changes in measurements and scores from one age to another.

III. Accomplishments During the Year:

Of the 24 Angus calves and 23 Hereford calves which were started on the third and final feeding trial on October 8, 1957, 23 Angus and 23 Hereford calves completed the trial on May 20, 1958. Group fed heifers and steers gained on the average of 0.16 and 0.21 pounds more

Md per day respectively, than those fed individually. The results of all three trials were similar in that calves fed in groups gained more rapidly on the average, 0.19 pounds more per day for both heifers and steers, than those fed individually. Data were secured as per the modified project statement. Analysis of the data has not been initiated because the project leader was on sabbatical leave from September 1957 to February 1959.

IV: Future Plans:

Analysis of the data will be initiated as soon as possible.

V: Publications During the Year:

None

VI: Publications Planned:

Manuscripts will be prepared as rapidly as the analysis of the data will permit.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Line or group designation	University of Maryland			
Location				
Breeding of calves	Angus		Hereford	
Av. inbreeding (%)				
	Individually	Group	Individually	Group
Steers, No. Full Fed	9	4	8	8
Av. inbreeding (%)	Outbred Herd		Outbred Herd	
Av. weaning wt. (lbs)	559	531	462	459
Av. initial age (days)	253	246	207	211
Av. initial wt. (lbs)	559	531	462	459
Length of feeding period (days)	224	224	224	224
Av. daily gain (lbs)	1.67	1.72	1.66	1.96
Av. score type conditions	13	14	13	13
Feed per cwt. gain (lbs)	918	930	834	745
Concentrates	733	761	647	597
Roughage	181	169	187	148
Heifers, No. Full Fed	4	6	4	3
Av. inbreeding (%)	Outbred Herd		Outbred Herd	
Av. weaning wt. (lbs)	515	495	441	463
Av. initial age (days)	273	248	205	253
Av. initial wt. (lbs)	515	495	441	463
Length of feeding period (days)	224	224	224	224
Av. daily gain (lbs)	1.38	1.61	1.59	1.70
Av. score type conditions	13	13	13	13
Feed per cwt. gain (lbs)	1074	906	1091	843
Concentrates	813	718	872	665
Roughage	261	188	219	178

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1958

University of Maryland

Line or group designation		
Breeding:	Angus	Hereford
Sex: Heifers to be added to herd**		
No.	5	5
Av. age (fall 1957) 11/13	21.6 mo.	22.2 mo.
Av. wt. (11/13/57)	925	973
Av. winter gain	104	70
Days on pasture 1958*	195	195
Av. gain on pasture	75	121

* Grazed on permanent pasture from April 26 to November 7.

** Above heifers were selected to go back into breeding herd and were fed for development rather than finish. From November 13, 1957 to April 26, 1958 wintered on approximately full feed roughage (silage and hay) and 2 to 6 pounds of concentrates per head daily.

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MISSISSIPPI STATION

-by-

J. C. Taylor, C. E. Lindley and B. G. Ruffin

I. Project Title:

A Study to Determine the Breeding Worth of Inbred and Outbred Bulls From Various Sources. RRFE-1. (S-10) Coop ARS.

II. Objectives:

A. To compare the growth rate, carcass qualities and maternal abilities of the progenies of bulls selected from various sources as potentially superior sires.

B. To develop ahigh producing herd of cows by using the progeny of good producing bulls as replacement heifers.

C. To determine the effectiveness of a selection index when used on heifers at weaning time.

III. Accomplishments During the Year:

A. Approximately a 350 cow herd made up of grade Angus, Hereford and Shorthorn is presently being maintained on property leased from the Federal Government and located at Prairie, Mississippi.

B. Research results:

Calves from eight tester bull units were born during the spring of 1958. Bulls other than control bulls from the Mississippi Station used were 2 Hereford bulls from the Colorado Station, one Hereford from the California Station, and one Angus from the Virginia Station. The calves were identified and weighed at birth. At weaning, weights and grades were obtained on all calves and only the first five steers born in each bull unit were selected as tester steers and placed on winter grazing consisting of oatsand rye grass. A total of 52 replacement heifers were selected at weaning on the basis of an index which gave equal emphasis to weaning gain and grade. Approximately the top one-half of the heifers were selected from each sire unit. Weaning data is shown in the accompanying tables for the 1958 calf crop.

The 28 tester steers selected from the 1957 calf crop were on winter grazing for 84 days until June 6, 1958 at which time they were started on a fattening ration fed on native pasture for 144 days. Gains for both periods as well as slaughter data are shown in the accompanying tables.

IV. Future Plans:

Project will be continued.

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation		
Location	----------University of Maryland	
Breed of sire	Angus	Hereford
Breed of dam	Angus	Hereford
No. cows bred	34	33
No. cows calving	32	29
No. calves raised	31	25
Av. inbr. of dams (%)	Outbred Herd	Outbred Herd
Av. inbr. of calves (%)	Outbred Herd	Outbred Herd
Av. birth date	2/1/58	3/4/58
Av. birth wt. (lbs):		
Bulls	64	68
Heifers	56	65
Were calves creep fed?	Yes	Yes
Av. weaning date:		
Bulls	10/7/58	10/7/58
Steers	10/7/58	10/7/58
Heifers	10/7/58	10/7/58
Av. weaning wt.:		
Bulls		
Steers	512	493
Heifers	500	435
Adjusted av. daily gain - birth to weaning-205 days	S-2.02 H-1.87	S-2.03 H.1.82
Av. weaning type score:		
Bulls		
Steers	13	13
Heifers	14	13
Av. weaning condition score:		
Bulls		
Steers	13	13
Heifers	13	13

V. Publications:

Summary of results of project published in April 1958 edition of Mississippi Farm Research.

VI. Publications Planned:

Summary of results of project to be published in Mississippi Farm Research.

* * * * * * * * *

I. Project Title and Persornnel:

Lowered Fertility in the Bovine. HE-J9 (S-10).
Bryan Baker, Jr., J. W. Scales, Fred Rothwell and C. O. Woody.

II. Objectives:

A. Make a survey of the reproductive performance of cattle in the Mississippi Experiment Station System.

1. Determine the reproductive efficiency for each herd of the System.
2. Determine what factors may be contributing to reproductive inefficiency.

B. To determine the nature of sterility in cows leaving the herd because of low reproductive performance.

C. Propose and test possible treatments which may increase reproductive efficiency.

III. Accomplishments During the Year:

A. Approximately twenty cows that were classified as hard to settle cows (cows that were open after two breeding seasons) were accumulated from the experiment station herds for this study. Upon receipt of these cows they were blood tested for Brucellosis and Leptospirosis and the reproductive organs palpated via the rectum. Twice daily these cows were checked for estrus and during the second estrus they were bred artificially to bulls of known fertility. If the cows settle on this service (based on failure to return to estrus) they are slaughtered 40 days post breeding. If, however, they do not settle and return to estrus, they are rebred and slaughtered 3 days later. The reproductive tracts are examined macroscopically in detail, and bacteriological smears are made of the vagina, cervix and uterus.

B. Research Results. Because previous data collected in this project indicated that at least 25 per cent of the cows that failed to settle had fertilized ova it was speculated that reproductive efficiency of hard to settle cows might be improved by progesterone injections. The twenty cows were divided into three groups: (1) Control group,

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(2) Progesterone injections for 165 days followed by an injection of 400 I. U. of P:M:S: on the 16th day, (3) Same treatment as group 2 except that each cow was injected with 125 mg. of long acting progesterone on the day following breeding. At the present time results are not complete but it appears that the progesterone treatment prior to breeding might not be desireable because the estrual behavior of the treated cows following treatment was erratic. The cows are now being slaughtered and bacterial cultures of the reproductive tract are being made.

Data concerning the overall performance of the beef herds of Mississippi Experiment Station were collected. In general, most of the herds had acceptable reproductive performance. There was considerable variation in the calving interval between herds. These data were also studied to obtain estimates of the influence of certain factors on performance up to weaning.

The average unadjusted weaning age was 245 days and the unadjusted weaning weight of Hereford and Angus calves combined was 444 pounds. After being adjusted to a constant age of 205 days, the Angus male and female calves averaged 413.6 and 389.3 pounds, and the Herefords 386.4 and 362.1 pounds, respectively. Sex was adjusted for by multiplying the weight of female calves by 1.06. Correction factors for cows of 2, 3, 4, 11, and 12 years of age were 1.09, 1.09, 1.05, 1.03, and 0.96, respectively. The Angus calves were 26.2 pounds heavier than the Hereford calves after all adjustments were made.

The average birth weights were 61.6 pounds for the Angus calves and 66.5 pounds for the Hereford calves.

Apparently weaning grade was not influenced by sex of calf in this study. The calving interval was 460.3 days for the Angus cows and 412.5 days for the Hereford cows.

Correlations were: between weaning weight and weaning grade, 0.36 and 0.40; between weaning weight and birth weight, 0.35 and 0.40; and between birth weight and weaning grade (-) 0.07 and 0.11 in the Angus and Hereford herds, respectively.

Heritability estimates were all higher than those reported by most workers. Repeatability estimates for birth weight were slightly higher than most estimates obtained by other workers, while estimates for weaning were slightly lower.

IV. Future Plans:

The project will be continued.

V. Publications:

Meade, James H., Factors Influencing Weaning Weights of Angus and Hereford Cattle in Mississippi. M. S. Thesis, 1959, Mississippi State University.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1958
Prairie Station

Line or group designation	Bridwell	Texas	Georgia 1078	Duke	Virginia 917	Kentucky
Breeding:	Hereford	Hereford	Hereford	Hereford	Angus	Angus
Sex:	M	M	M	M	M	M
No.	5	5	5	4	5	4
Av. age - days (fall 1957)	260	259	262	254	265	243
Av. wt. (fall 1957)	438	511	501	380	490	482
Days on pasture*	84	84	84	84	84	84
Av. gain on pasture	139	109	130	114	78	100
Days on feed	144	144	144	144	144	144
Av. gain on feed	237	306	235	220	208	227
Animals slaughtered: Averages at slaughter						
Age (days)	618	617	620	612	623	601
Weight	858	987	910	812	907	886
Live grade	9.9	10.2	10.5	10.8	10.0	10.2
Dressing percent**	58.8	59.8	61.0	60.2	61.1	61.0
Carcass grade	8.8	9.0	9.2	9.0	10.2	10.8

* Following the 84 day period on rye grass winter pasture, the steers were full-fed ground shelled corn and soybean meal on native pasture for 144 days.

** Dressing percent was obtained from final weight and hot carcass weight.

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	Calif.Rover 310	Natchez	Colo.Brae Arden3112	Colo.Royal 3016	Kentucky	Va. 917	Prairie Queen	Pingrey
Location	Prairie Station							
Breed of sire	Hereford	Hereford	Hereford	Hereford	Angus	Angus	Angus	Angus
Breed of dam	Hereford	Hereford	Hereford	Hereford	Angus	Angus	Angus	Angus
No. cows bred	30	30	30	30	30	30	31	33
No. cows calving	27	24	27	26	21	20	18	25
No. cows raised	24	23	24	22	16	20	16	25
Av. birth date	3/9/58	2/24/58	3/5/58	3/2/58	3/25/58	3/19/58	3/19/58	3/19/58
Av. birth wt. (lbs):								
Bulls	74.0	76.0	70.0	74.0	59.0	65.0	67.0	62.0
Heifers	66.0	62.0	70.0	64.0	59.0	60.0	55.0	62.0
Were calves creep fed?	No	No	No	No	No	No	No	No
Av. weaning date:								
Bulls	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58
Steers	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58	10/16/58
Heifers								
Av. weaning wt.:								
Bulls	(15) 356.5	(7) 340.2	(13) 367.7	(11) 378.5	(6)374.9	(13)423.2	(12)433.2	(13)400.0
Steers	(9) 357.1	(16) 343.2	(11) 379.3	(11) 361.4	(9)363.3	(7)383.2	(4)390.6	(12)399.0
Heifers								
Adjusted av. daily gain - birth to weaning**	1.43	1.41	1.53	1.52	1.53	1.73	1.77	1.70
Av. weaning type score:								
Bulls	11.0	10.4	11.0	10.9	10.8	11.2	10.9	11.0
Steers	11.5	10.5	11.1	10.5	10.0	10.3	10.2	11.4
Heifers								

* () shows the number of animals involved. Weaning weight adjusted to average of 205 days and mature dam equivalent.

** Average daily gain adjusted to a steer basis and mature dam equivalent.

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NORTH CAROLINA STATION

-by-
J. H. Gregory

I: Project Title:

The Improvement of Beef Cattle Through Breeding Methods. Anim. Indus. 74. (S-10) Coop. ARS

II. Objectives:

(a) To evaluate the feedlot performance of purebred Hereford, Angus and Shorthorn bulls and heifers.

(b) To continue the study of total performance of the progeny of bulls used in the same herd the same year.

III: Accomplishments During the Year:

Eight Hereford, 4 Angus, 4 Shorthorn and 1 Romo Carolina bull calves were full fed for 168 days on pasture. Five Hereford bulls were assigned to a cow herd. There was no trouble in breeding. Twelve Hereford, 7 Angus, 2 Shorthorns and 3 Romo Carolina heifer calves were limited fed for 168 days on pasture.

Twenty steers consisting of three sire groups from the Tidewater Station were fed and carcass information obtained. Sixteen steers from two sire groups from the Upper Mountain Station are on feed at present. Carcass information will be obtained from these steers.

IV: Future Plans:

The project is in the process of being revised. There will be three bulls used across the three herds, with all bulls being kept at the Raleigh station, and artificial insemination will be practiced. The bulls will be selected from the purebred herd in Raleigh and a sire by location interaction will be studied. Steer progeny will be divided in two groups at each station with one-half of each sire progeny receiving a high energy ration and the other half receiving a high roughage ration. Half sibs of the bulls kept for breeding will be fed a high energy ration for approximately 3 months after the end of the 168 day feedlot performance test. These bulls will be slaughtered and carcass information will be obtained.

V: Publications:

The Influence of Sex of Calf and Age of Dam on Six-month Weights of Beef Calves. Patterson, James W. M.S. Thesis. D. H. Hill library.

Genetic and Environmental Relationships between Prenatal and Post Natal Growth in Beef Cattle. White, R. H. M.S. Thesis. D. H. Hill Library.

The Relationship Between the Performance of Bulls to the Performance of Their Progeny. Gregory, J. H. M.S. Thesis. D. H. Hill Library.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Line or group designation Location	Hereford	Angus	Shorthorn	Romo Carolina
	----------	Raleigh,	North Carolina	----------
Bulls, No.	8	4	4	1
Av. weaning wt. (lbs)	458	487.5	499	550
Av. initial age (days)	258	259	238	266
Av. initial wt. (lbs)	502	519	534	515
Length of feeding period (days)	168	168	168	168
Av. daily gain (lbs)	1.37	1.55	1.73	1.85
Av. score	10.91	10	10	7
Feed per cwt. gain (lbs)				
Concentrates	7.82	7.82	7.82	7.82
Roughage	2.10	2.10	2.10	2.10
Heifers, No.	12	7	2	3
Av. weaning wt. (lbs)	435	483	505	478
Av. initial age (days)	305	315	280	209
Av. initial wt. (lbs)	479	532	558	533
Length of feeding period (days)	168	168	168	168
Av. daily gain (lbs)	1.02	1.12	1.49	1.02
Av. score	11.25	11.71	11.5	7.67
Feed per cwt. gain (lbs)				
Concentrates	939	939	939	939
Roughage	403	403	403	403

PRODUCTION AND SLAUGHTER DATA ON HEREFORD YEARLING STEERS AT THE TIDEWATER STATION

No.	20
Av. age (fall 1957)	9 mos.
Av. wt. (fall 1957)-lbs	500
Days on pasture	60
Av. gain on pasture	1.75
Days on feed	206
Av. wt. adjusted to 18 or 30 mos. of age	765
Av. gain on feed	2.00
Averages at slaughter	
Age	24 mos.
Weight	1122
Live grade	11.4
Dressing percent	57.71
Carcass grade	10.55

PERFORMANCE OF COW HERDS. 1958 CALVES
NORTH CAROLINA STATIONS

Line or group designation	Hereford	Hereford	Hereford Angus		Shorthorn
Location	Plymouth	Laurel Springs	------Raleigh------		
Breed of sire	Hereford	Hereford	Hereford	Angus	Shorthorn
Breed of dam	Hereford	Hereford	Hereford	Angus	Shorthorn
No. cows bred	55	53	44	19	12
No. cows calving	45	37	38	19	10
No. cows raised	41	32	34	18	9
Av. birth date	7/10/58	2/1/58	1/11/58	1/3/58	1/8/58
Av. birth wt. (lbs):					
Bulls	71.5	60.5	59	66	64
Heifers	67.9	62.78	54	56	67
Were calves creep fed?	No	No	No	No	No
Av. weaning date:	11/6/58	10/7/58	9/3/58	9/3/58	9/3/58
Bulls					
Steers					
Heifers					
Av. weaning wt.: (182 days of age)			------10/24/58------		
Bulls					
Steers	355.5	366	470	520	490
Heifers	337.8	335	440	490	443
Adjusted av. daily gain - birth to weaning*	1.53	1.59	1.61	1.78	1.64
Av. weaning type score:					
Bulls			11.50	12.50	11.33
Steers	9.44	10.5			
Heifers	9.0	10.8	11.00	11.67	11.00

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SOUTH CAROLINA STATION

-by-
W. C. Godley and E. G. Godbey

I. Project Title:

The Use of Purebred and Crossbred and Crossbred Cows in the Production of Slaughter Calves. Anim. Husb. 25 (S-10)

II. Objectives:

To determine the birth and weaning weights, market and carcass grades and dressing percentages of fat calves sired by a Shorthorn bull and out of purebred Angus cows, or crossbred cows of the following breeding:

(1) Brahman x Hereford
(2) Brahman x Angus
(3) Hereford x Angus

III. Accomplishments During the Year:

Thirty-seven of the forty calves born in 1958 were weaned. The data on four of these calves which were dropped late in the season were not included in summarizing the records. The calves out of the Hereford x Angus cows were heavier at birth while the calves out of the Brahman x Angus cows were heaviest at weaning. Differences among the breeding groups in slaughter and carcass grades were small. The calves out of Brahman x Hereford dams had slightly higher dressing percentages than those in the other groups.

This concludes a five year study in which complete data has been secured on 167 calves. A summary of these data is shown in the following table.

The data collected in the first and second phases of this study were analyzed and prepared for publication. The results of the first phase were published as the South Carolina Agricultural Experiment Station bulletin Number 468.

Average Adjusted Birth Weight, 210-Day Weight, Slaughter Grade, Carcass Grade and Dressing Percentage of Calves, by Breeding Groups.

Breeding Group	Weight (Lbs.)		Grade*		Dressing
	Birth	210-Day	Slaughter	Carcass	Percentage
Sh x A	67.29	498.01	15.74	16.23	58.65
Sh x HA	75.39	513.06	16.06	17.55	58.19
Sh x BA	69.78	557.47	15.57	16.51	58.38
Sh x BH	68.17	537.61	14.73	15.96	59.78

* 8-12 Choice, 14-18 Good.

IV. Future Plans:

A new project entitled, "The Response of Sire Progenies to Different Management Procedures", has been approved as a contributing project to S-10. The purebred Angus and Hereford herds at the College and Coast Station will be used in this study.

V. Publications During the Year:

Godbey, E. G., W. C. Godley, L. V. Starkey and E. D. Kyzer. Brahman x British and British x British Matings for the Production of Fat Calves. South Carolina Agric. Expt. Sta. Bulletin 468.

VI. Publications Planned:

The data collected during the second phase of this study have been analyzed and prepared for publication. The manuscript will be submitted to the Journal of Animal Science at an early date.

PERFORMANCE OF COW HERDS. 1958 CALVES
South Carolina Agricultural Experiment Station

Line or group designation	Angus	Hereford	Angus	Hereford
Location	--Clemson-------		--Summerville---	
Breed of sire	Angus	Hereford	Angus	Hereford
Breed of dam	Angus	Hereford	Angus	Hereford
No. cows bred	29	21		
No. cows calving	28	19	29	19
No. cows raised	28	18	25	17
Av. birth date	2/14/58	1/24/58	3/2/58	1/27/58
Av. birth wt. (lbs):				
Bulls	64.0	71.4	65.4	76.0
Heifers	59.5	67.5	65.5	70.1
Were calves creep fed?**	1	1	1	1
Av. weaning date:				
Bulls				
Steers	9/8/58	8/22/58	9/25/58	8/24/58
Heifers	9/8/58	8/19/58	9/18/58	8/28/58
Av. weaning wt.:				
Bulls				
Steers	433	413	473	445
Heifers	421	407	444	386
Adjusted av. daily gain - birth to weaning*	1.98	1.81	2.03	1.69
Av. weaning type score:				
Bulls				
Steers	11.5	9.9	10.7	10.3
Heifers	11.9	10.9	11.5	10.8

* Daily gain adjusted for creep feeding, sex and age of dam.

** One half of the calves were creep fed.

Line or group designation				
Location	---------Summerville, S. C.----------			
Breed of sire	Shorthorn	Shorthorn	Shorthorn	Shorthorn
Breed of dam	Angus	H x A	B x A	B x H
No. cows bred	9	11	10	10
No. cows calving	9	11**	10	10
No. cows raised	9	11	7	10
Av. birth date	1/15/58	1/21/58	1/29/58	2/5/58
Av. birth wt. (lbs):				
Bulls	65.5	69.0	64.0	69.3
Heifers	63.2	76.0	69.3	67.7
Were calves creep fed?	Yes	Yes	Yes	Yes
Av. weaning date:				
Bulls				
Steers	8/22/58	8/17/58	8/29/58	9/8/58
Heifers	8/7/58	8/19/58	8/28/58	8/31/58
Av. weaning wt.:				
Bulls				
Steers	466.7	458.3	530.0	533.3
Heifers	435.0	462.5	570.0	497.6
Adjusted av. daily gain - birth to weaning*	2.05	2.19	2.32	2.24
Calves slaughtered at weaning:				
1. Steer or bull calves				
No.	3	3	5	3
Av. age (days)	212	211	208	208
Av. wt.	458.33	441.67	514.00	513.33
Av. slaughter grade	Good	Good-	Good	Good
Av. dressing per cent	60.83	59.80	58.38	61.97
Av. carcass grade	Good	Good-	Good	Good
2. Heifer calves				
No.	4	6	2	7
Av. age (days)	212	212	208	212
Av. wt.	416.25	451.67	550.00	482.14
Av. slaughter grade	Good	Good	Good	Choice-
Av. dressing per cent	59.93	59.78	60.75	61.79
Av. carcass grade	Good	Good	Good	Good

* Adjusted for sex and year of birth.

** One calf died - one cow produced twins.

Report of the South Carolina Agricultural Experiment Station
1959 Annual Meeting for S-10

South Carolina has completed two projects contributing to S-10. In the first project, 1948 to 1953, purebred Angus, Brahman and Hereford bulls were bred to Angus and Hereford cows to study the effect of breeding on the production of slaughter calves. A total of 310 calves were produced during this test. The data collected on these animals were analyzed and published by the South Carolina Station as Experiment Station Bulletin No. 468. Least square estimates for the effect of year, breeding and sex are shown in table 1. The average adjusted birth weight, 210-day weight, animal grade, carcass grade and dressing percentage of calves by breeding groups are shown in table 2.

The second test supporting the S-10 project was completed in 1958. A total of 167 calves were produced during the five years of this test (1954 - 1958). These data have been analyzed, and a manuscript submitted to the Journal of Animal Science for publication. The objectives of the second phase were to determine the birth and weaning weights, market and carcass grades and dressing percentages of fat calves sired by a Shorthorn bull and out of purebred Angus cows or crossbred cows of the following breeding: Brahman x Hereford, Brahman x Angus and Hereford x Angus. The cows used were purebred Angus and the crossbreds produced during the first study. Least square estimates of the influence of breeding, year of birth and sex on the traits studied are shown in table 3. The average adjusted birth weight, 210-day weight, slaughter grade, carcass grade and dressing percentage of calves are shown by breeding groups in table 4. The adjusted birth weight of the calves varied from 67.29 pounds for those out of Angus dams to 75.39 pounds for those out of the crossbred Hereford x Angus cows. The weights of the calves of the Angus, Brahman x Angus and Brahman x Hereford cows did not differ significantly from each other but were significantly lower than those of the calves out of Hereford x Angus cows. Calves out of the purebred Angus cows were 4.16 pounds lighter at birth than the average of those produced by the crossbreds. The average birth weight of the calves in each breeding group was lower than the corresponding weights of their dams, which were produced in the previous study. The adjusted 210-day weights were 498.01 poun for the Shorthorn x Angus, 513.06 pounds for the Shorthorn x Hereford Angus, 557.47 pounds for the Shorthorn x Brahman Angus and 537.61 pounds for the Shorthorn x Brah Hereford calves. The differences between the weights of the calves out of the Angus and Hereford x Angus dams were not significant. Differences found in all the other comparisons were significant. Calves out of the Brahman x Angus dams were significantly heavier at 210 days of age than the calves out of the other breeding group The calves out of the Brahman x Hereford dams were heavier than those out of the Hereford x Angus cows or the purebred Angus cows. The Shorthorn x Angus calves which were lighter at birth were also the lightest at 210 days of age. The Shorthorn x Hereford Angus calves which were heaviest at birth made slower gains during the suckling period and weighed less than the Shorthorn x Brahman Angus and Shorthorn x Brahman Hereford at 210 days of age. The average 210-day weight of the calv out of the dams that were sired by Brahman bulls was 34.48 pounds heavier than thos out of the British crossbred dams and 49.53 pounds heavier than those out of purebred Angus cows. There was only one-third grade variation n the average slaughter grade of the calves from the different breeding groups. Calves out of Brahman x Hereford cows graded high good, while those from the other groups graded middle goo The only difference that was large enough to be significant was found when the Shorthorn x Brahman Hereford were compared with the Shorthorn x Hereford Angus calves. Calves out of the Hereford x Angus cows which had the poorest slaughter grade also produced the lower grading carcasses. The carcasses from these calves graded low good which was significantly different from those produced by the other breeding

groups. The grades of the carcasses from the calves out of Angus, Brahman x Angus and Brahman x Hereford cows were middle good. The calves out of the Brahman x Hereford cows had the best slaughter and carcass grade and also the highest dressing percentage. The average dressing percentage of these calves was significantly higher than that found in the other groups. The calves out of Angus, Brahman x Angus and Hereford x Angus cows did not differ significantly.

In 1959 a third project entitled, "The Response of Sire Progenies to Management and Feeding Procedures," was approved by the Executive Committee as a contributing project to S-10. The objectives of this study are:

(1) To investigate the response of sire progenies, as measured by live animal and carcass traits, to methods of producing slaughter cattle.

(2) To evaluate the magnitude and importance of average genotype with certain environmental influences.

(3) To develop through selection herds of beef cattle with superior performance.

The first calves produced for this project will be weaned this fall.

LEAST SQUARES ESTIMATES OF THE INFLUENCE OF YEAR, BREEDING AND SEX ON THE TRAITS STUDIED

TABLE 1.

	Birth Weight	210-Day Weight	Slaughter Grade[1]	Carcass Grade[1]	Dressing Percentage
1948	.06 ± 2.08	-57.01 ± 9.99	2.54 ± .61	4.46 ± .73	-1.29 ± .56
1949	1.30 ± 1.83	-27.10 ± 8.80	2.33 ± .54	2.67 ± .72	-1.93 ± .56
1950	-3.76 ± 1.68	-20.43 ± 8.06	2.62 ± .49	3.52 ± .64	- .27 ± .49
1951	0.00 ±	0.00 ±	0.00 ±	0.00 ±	0.00 ±
1952	1.86 ± 1.33	1. 67 ± 6.38	.36 ± .39	-1.11 ± .58	.59 ± .45
1953	- 4.70 ± 2.00	-17.17 ± 9.64	- .23 ± .58	.47 ± .98	-2.73 ± .74
A	-17.69 ± 1.34	-60.49 ± 6.44	-1.26 ± .71	.15 ± .46	-1.54 ± .35
H x A	-10.11 ± 1.67	- 6.26 ± 8.04	-2.70 ± .49	-1.25 ± .62	- .26 ± .47
B x A	0.00	0.00	0.00	0.00	0.00
H	- 8.63 ± 1.95	-86.02 ± 9.41	1.25 ± .57	3.07 0 .80	-4.23 ± .61
A x H	- 9.46 ± 2.07	-54.77 ± 9.97	.99 ± .61	1.70 ± .93	-4.87 ± .71
B x H	- 8.34 ± 2.04	-65.03 ± 9.80	3.33 ± .60	2.87 ± .84	-3.29 ± .63
Heifers	-8.98 ± .98	-41.13 ± 4.74	-.69 ± .28	-1.82 ± .50	.14 ± .37
Steers	0.00	0.00	0.00	0.00	0.00

[1] 8-12 Choice, 14-18 Good.

AVERAGE ADJUSTED BIRTH WEIGHT, 210-DAY WEIGHT, ANIMAL GRADE, CARCASS GRADE AND DRESSING PERCENTAGE OF CALVES, BY BREEDING GROUPS

TABLE 2.

Breeding Group	Weight (lbs.)		Grade[1]		Dressing Percentage
	Birth	210-Day	Slaughter	Carcass	
AA	68.97	507.30	14.39	14.73	57.99
HA	76.54	561.53	12.95	13.33	59.27
BA	86.66	567.79	15.65	14.58	59.53
HH	78.03	481.77	16.90	17.65	55.30
AH	77.20	513.01	16.65	16.28	54.67
EH	78.32	502.75	18.98	17.45	56.24
Average	77.40	528.36	15.46	15.03	58.10

[1] Grade used: 8-12 Choice, 14-18 Good.

LEAST SQUARES ESTIMATES OF THE INFLUENCE OF BREEDING, YEAR OF BIRTH AND SEX ON THE TRAITS STUDIED

TABLE 3.

	Birth Weight	210-Day Weight	Slaughter Grade	Carcass Grade	Dressing %
S x A	-2.49 ± 1.79*	-59.46 ± 8.24	.17 ± .54	- .28 ± .44	.27 ± .49
S x HA	5.61 ± 1.74	-44.41 ± 7.80	.49 ± .52	1.04 ± .42	- .19 ± .47
S x BA	0.00	0.00	0.00	0.00	0.00
S x BH	-1.61 ± 1.94	-19.86 ± 8.96	-.84 ± .58	- ..55 ± .48	1.40 ± .53
1954	-6.04 ± 2.48	-46.87 ± 11.39	-2.37 ± .74	- 3.96 ± .61	-1.79 ± .67
1955	-5.50 ± 1.91	-21.39 ± 8.79	-2.33 ± .57	- 4.27 ± .47	.23 ± .52
1956	-2.60 ± 1.83	-18.15 ± 8.42	-1.02 ± .55	- 2.38 ± .45	.16 ± .50
1957	0.00	0.00	0.00	0.00	0.00
1958	.08 ± 1.94	-13.82 ± 8.94	- .97 ± .58	- 1.16 ± .48	1.93 ± .53
Heifers	-2.85 ± 1.30	-41.27 ± 5.98	- .71 ± .39	- ..52 ± .32	- .13 ± .35
Steers	0.00	0.00	0.00	0.00	0.00

* Standard errors are shown for each estimate.

AVERAGE ADJUSTED BIRTH WEIGHT, 210-DAY WEIGHT, SLAUGHTER GRADE, CARCASS GRADE AND DRESSING PERCENTAGE OF CALVES, BY BREEDING GROUPS

TABLE 4.

Breeding Group	Weight (lbs.)		Grade*		Dressing Percentage
	Birth	210-Day	Slaughter	Carcass	
S x A	67.29	498.01	15.74	16.23	58.65
S x HA	75.39	513.06	16.06	17.55	58.19
S x BA	69.78	557.47	15.57	16.51	58.38
S x EH	68.17	537.61	14.73	15.96	59.78

* 8-12 Choice, 14-18 Good

Tennessee Station
-by-
C. S. Hobbs, Joe W. High, H. J. Smith

I. Project title:

The Improvement of the Producing Ability of Beef Cattle. Hatch 61 (S-10) Coop. ARS

II. Objectives:

(a) To develop lines or line crosses, or combinations of lines and crosses of beef cattle which will make the most efficient use of Tennessee pastures and forages and that will result in an improvement of such characters as rate of gain, economy of gain, carcass quality, fertility and longevity.
(b) To develop effective breeding techniques for the improvement of existing lines of beef cattle.
(c) To investigate the productivity of existing lines of beef cattle.
(d) To investigate the effect of different levels of nutrition on the development of type and confirmation, on economy of gain, fertility and longevity.

III. Accomplishments During the Year:

(a) The major facilities and cattle acquired during the year included:
(1) Beef cattle barn with two silos at the Tobacco Experiment Station, Greeneville. This barn has sufficient space and facilities for handling the breeding herd during the winter and can be partitioned into 8 lots for fattening steers. Weighing facilities are included.
(2) Approximately 48 yearling Hereford heifers were purchased for additions to herds at three locations. Five Hereford and two Angus bulls were purchased.
(3) About 100 acres of new permanent pasture was seeded at Ames Plantation, Grand Junction. Several pastures were renovated at different locations.

(b) Research Results:
(1) The development of lines and herds at all locations was continued during 1958. The weaning performance of calves in cow herds and for bull progenies are shown in accompanying tables. Progeny test information was obtained on 31 Hereford sires at six locations and 15 Angus sires at three locations during 1958. Results of these tests show considerable differences among sire progenies on a within location basis and indicate the importance of progeny testing in the final evaluation of sires. Thirty-five bull calves were fed on postweaning gain evaluation tests and included 18 Hereford and 17 Angus calves. These bull calves were selected at weaning time on the basis of a weaning index which gives equal importance to type grade and adjusted daily gain.

Complete performance data were obtained on about 750 calves at nine locations. This information is used in the selection of herd replacements and in the evaluation of the producing ability of cows and of her sires. Results obtained by the use of performance selection methods in herd improvement indicate that considerable progress may be made in the improvement of some economic traits including daily gain and type score through intense application of such methods. In one herd, the adjusted daily gain of calves has increased from an average of about 1.61 pounds in 1952 to about 1.95 pounds in 1958. However, part of this progress was probably due to better feed and management.

(2) A study was made of the relationships between the calf's average daily gain, type grade, and condition grade from birth to 137 days of age and birth to weaning (210 days). Data were analyzed from 744 calves at six different locations for the years 1957 and 1958 to determine (1) the relationship between calf performance from birth to about 137 days and birth to weaning and (2) the repeatability of cow performance at 137 days and at weaning. Simple correlation and regression coefficients were calculated on a within sex, age of dam, year and location basis.

An average correlation coefficient for all locations of .86 was obtained between average daily gain from birth to 137 days and average daily gain from birth to weaning and the regression of daily gain from birth to weaning on daily gain from birth to 137 days was .73 pound. The range of the correlation coefficients for the six locations was from .82 to .90. (Table I).

The correlation between type grades for the various periods of growth from birth to weaning was .66. The regression of type grade at weaning on type grade at 137 days was .72. (Table I).

The correlation between condition grades at 137 days and weaning was .5 and the regression of condition grade at weaning on condition grade at 137 days was .62. Correlation coefficients for all three characteristi were highly significant.

Repeatability estimates for average daily gain from birth to 137 and birth to 210 days of age were also determined by two different methods: (1) intraclass correlation, and (2) correlation between successive performance records.

The repeatability estimates for daily gain from birth to 137 days of ag were .38 and .37 for intraclass correlation and correlation between suc cessive performance records, respectively. From birth to 210 days of a the estimates were .30 and .32 for intraclass correlation and correlati between successive records, respectively. (Table II).

The correlations and repeatability estimates obtained in this study indicate that the performance of a cow's calf from birth to 137 days of age can be used to predict future productivity sufficiently well to warrant its use as a tool in a system for selecting and culling cows. Cows producing calves that have low performance records at 137 days can on the average be expected to produce calves that have low performance records at weaning.

(3) Weanling performance data from 2,443 calves at four locations were studied to determine the influence of numerical day of birth in the calving season on adjusted daily gain, type score, condition score and weanling index. Average values for each of these traits were calculated for successive 10-day periods within locations, combining all years. The influence of birth date on performances also was studied by regressing the various traits on numerical day in year calved within seasons. Regression coefficients were first calculated for years within locations. A common regression was obtained for each location by pooling the data for all years. Average regression coefficients were determined for Hereford, Angus, and all cattle. Data from calves born from January 1st to July 8th were analyzed separately from data for calves born July 9th to December 31st. Correlations were also determined between performance in each of the traits and day in year calved.

Differences among average adjusted daily gains for 10-day calving periods in both the first and second half of the year were not significant, indicating that day calved within season of birth would have relatively little influence on the growth rate of calves born over a limited period of time. Considerable differences were found in the adjusted daily gain of calves born in the first half of the year as compared with the second half of the year. Calves born in the first half of the year gained an average of 0.18 to 0.33 pound per day more than calves born in the last half of the year. Regression coefficients for adjusted daily gain on numerical day in season calved were variable and not consistent for all locations. The average regression, of adjusted daily gain on day in season calved for Alcoa, Springfield, Crossville and Oak Ridge was .0003, .0004, .0010 and -.0018, respectively. The positive regressions indicate that calves born later in the season gained more rapidly than those born earlier and the negative regression indicates that calves born earlier in the season gained slightly faster than the calves born later. Even though there is a statistically significant difference in some of these regressions, they do not appear to be of much practical importance.

Type scores were significantly influenced by the period of calving in both the first and second half of the year. During the first half of the year type scores were highest for the first nine ten-day periods (January, February and March). During the last half of the year, type score tended to increase in numerical day of birth of the calf. The regressions of type score on day in season calved indicated an advantage in type score for calves born early in the first half of the year. Although the trend was slight, there was a decrease in type score with an increase in numerical day of birth of the calf. In the last half of the year, type score tended to increase with an increase in numerical day of birth of the calf.

Condition scores were also significantly affected by numerical day of birth within seasons. The condition scores of calves born early in the first half of the year were significantly higher than condition scores of calves born later. Regression coefficients for condition score on day in season calved were consistently negative for all locations included in the study, indicating that early calves scored higher than late calves. Condition scores were highest for calves born in January, February and March.

The influence of numerical day of birth within season on the performance of the calf was not consistent for all locations. Differences among averages by 10-day periods for both the second half of the year were not significant.

The average weanling index for calves born during the last half of the year were considerably smaller than the index for calves born in the first half of the year for locations where such comparisons could be made. Regression coefficients for weanling index on day in season calved were positive at one location and negative at the other location involved in the study. Although some of these regressions within seasons were statistically significant for some locations, they do not appear to be of practical significance from the standpoint of over-all evaluation and selection.

These results indicate that the use of performance records that are uncorrected for numerical day of birth within restricted calving seasons of two to three months would not seriously affect the evaluation of possible genetic differences between individuals and subsequent selection as potential breeding stock. However, caution should be used in comparing records of calves born in different seasons of the year (i.e., in the first or second half of the year) and subjected to different environmental and management conditions during the suckling period. This would be particularly applicable for comparsons involving rate of gain and condition scores and, to a lesser extent, comparisons involving type score. The most logical plan would be limit the evaluation and comparison of the records of calves to within season comparisons after adjusting for the affects of sex and age of dam on performance. If direct comparisons are made between the records of calves born in different seasons, then such records should be adjusted for season of birth or serious errors could be made in selection.

IV. Future Plans:

(a) Continue the development of lines and herds at the main station and substations with emphasis on performance selection.
(b) Continue the performance and progeny testing of sires and evaluation of cow productivity in all herds.
(c) Initiate new phase in performance testing of bulls to compare full and limited feeding after weaning for growth and development and evaluation of bulls.
(d) Continue studies on levels of feeding; evaluation of the effect of creep feeding on calf performance as well as the measurement of cow and sire productivity; and the value of calf gains, grades and indexes at 120-days as criteria for the measurement of calf performance and cow productivity.

V. Publications During the Year:

Dixon, Joseph Leon. 1959. Relationships among performance traits of beef calves at 137 days and weaning. M. S. Thesis. University of Tennessee Library.

Griffey, Wallace A. 1959. The influence of date of birth and calving season on preweaning growth rate, type score, condition score and weanling index of beef calves. M. S. Thesis. University of Tennessee Library.

High, Joe W., C. M. Kincaid and H. J. Smith. 1958. Doddler cattle - An inherited congenital nervous disorder in Hereford cattle. Journal of Heredity XLIX: 250-252.

High, Joe W., H. J. Smith and C. S. Hobbs. 1959. The relationship of 120-day and weaning daily gains of beef calves. Proceedings of Assn. of So. Agr. Workers. Fifty-Sixth Annual Convention, Memphis, Tennessee.

VI. Publications Planned:

Results of the work will be published as justified.

VII. Personnel active in project:

C. S. Hobbs, H. J. Smith, J. W. High, Ralph Dodson, J. W. Cole, L. E. Orme and C. M. Kincaid, Knoxville; J. M. Bird and R. A. Reynolds, Oak Ridge; J. H. Felts, Greenville; J. A. Odom, Crossville; E. M. Safley, Springfield; E. J. Chapman and J. B. McLaren, Spring Hill; and R. Moorman, Grand Junction, Tennessee

Table I. Correlation Between Performance to 137 Days and to weaning and Regression of Performance to Weaning on Performance to 137 Days.

Location	Correlation			Regression		
	Daily Gain	Grade Type	Grade Cond.	Daily Gain	Grade Type	Grade Cond.
Alcoa (Purebred)	.90	.78	.44	.81	.72	.47
Alcoa (Grade)	.85	.52	.39	.68	.66	.44
Oak Ridge	.84	.67	.71	.71	.76	.76
Greeneville	.84	.88	.64	.70	1.06	.53
Crossville	.82	.71	.57	.62	.80	.66
Spring Hill	.86	.68	.48	.78	.68	.60
Ames Plantation	.82	.28	.53	.56	.28	.70
Average	.86	.66	.57	.73	.72	.62

Table II. Summary of Repeatability Estimates for Daily Gain for Different Periods of Growth at the Various Locations.

Location	Number of cows	Correlation Between Successive Performance Records		Intraclass Correlation	
		Birth to 137 Days	Birth to Weaning	Birth to 137 Days	Birth to Weaning
Alcoa (Purebred)	28	.51**	.19	.50**	.19
Alcoa (Grade)	33	.51**	.50**	.51**	.41*
Oak Ridge	25	.22	.32	.22	.32
Crossville	17	.31	.45	.36	.43
Columbia	17	.37	.15	.30	.14
Average	120	.37**	.32**	.38**	.30**

*5 percent level of significance.
**1 percent level of significance.

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	4033	4315	9000	9023	9046
Location	Alcoa, Tennessee				
Breed of Sire	Hereford	Hereford	Hereford	Hereford	Hereford
Breed of Dam	Hereford	Hereford	Hereford	Hereford	Hereford
No. cows bred	26	16	7	31	27
No. cows calving	23	14	6	28	24
No. calves raised	23	13	6	27	23
Av. inbr. of calves (%)	19			26	
Av. birth date	2/11/58	2/7/58	1/26/58	2/18/58	2/18/58
Av. birth wt.(lbs):	73	75	71	72	72
Bulls	77	77	74	76	75
Heifers	72	72	70	68	67
Were calves creep fed?	No	No	No	No	No
Av. weaning age (days)	231	201	247	223	225
Bulls	254	198	258	226	222
Heifers	227	206	241	220	231
Av. weaning wt.:	474	527	477	470	479
Bulls	578	546	508	497	493
Heifers	454	497	461	438	456
Adjusted av. daily gain - birth to weaning	1.90	2.30	1.76	1.88	1.94
Av. weaning type score:	12.5	12.2	11.7	12.8	12.0
Bulls	13.3	11.9	11.8	12.8	12.2
Heifers	12.4	12.6	11.6	12.8	11.7
Av. weaning condition score:	10.4	10.9	10.3	10.0	9.8
Bulls	9.2	9.8	9.0	9.6	9.0
Heifers	12.2	12.8	11.0	10.4	11.2

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	9075	9120	9217	9416	9611
Location	Alcoa, Tennessee				
Breed of sire	Hereford	Hereford	Hereford	Hereford	Hereford
Breed of dam	Hereford	Hereford	Hereford	Hereford	Hereford
No. cows bred	35	27	19	16	20
No. cows calving	31	24	17	14	18
No. cows raised	29	24	17	11	16
Av. inbr. of calves (%)		22			
Av. birth date	3/4/58	3/9/58	2/24/58	3/2/58	2/23/58
Av. birth wt. (lbs):	80	59	74	79	73
Bulls	81	60	73	82	75
Heifers	79	58	75	75	72
Were calves creep fed?	No	No	No	No	No
Av. weaning age (days)	206	203	217	214	221
Bulls	209	202	220	187	237
Heifers	204	204	214	229	214
Av. weaning wt.:	480	376	479	463	465
Bulls	515	393	486	431	533
Heifers	447	366	472	481	434
Adjusted av. daily gain birth to weaning	2.04	1.87	1.97	1.95	1.94
Av. weaning type score:	12.2	11.2	12.1	11.5	12.7
Bulls	12.5	11.8	12.3	12.0	12.9
Heifers	11.8	10.9	11.9	11.2	12.6
Av. weaning condition score:	9.4	9.0	9.7	10.0	10.3
Bulls	9.0	8.5	8.9	9.0	9.3
Heifers	9.7	9.3	10.4	10.6	10.7

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	2623	6432	9145	9510	9511
Location		Columbia		Greeneville	
Breed of sire	Hereford	Hereford	Hereford	Hereford	Hereford
Breed of dam	Hereford	Hereford	Hereford	Hereford	Hereford
No. cows bred	11	31	22	56	12
No. cows calving	9	26	19	45	10
No. cows raised	9	22	18	43	10
Av. inbr. of calves (%)		21	13	38	9
Av. birth date	1/30/58	2/23/58	3/5/58	3/28/58	3/25/58
Av. birth wt. (lbs):	72	67	62	59	63
Bulls	75	72	68	60	60
Heifers	69	62	58	57	69
Av. weaning age (days)	232	205	200	175	186
Bulls	234	199	195	165	187
Heifers	230	211	202	185	183
Av. weaning wt.:	468	429	402	347	377
Bulls	494	456	449	346	386
Heifers	447	405	381	348	360
Adjusted av. daily gain - birth to weaning	1.85	1.93	1.90	1.76	1.91
Av. weaning type score:	11.3	11.1	10.6	11.0	10.3
Bulls	11.9	11.2	11.5	11.2	10.9
Heifers	10.9	11.0	10.3	10.8	9.2
Av. weaning condition score	8.7	8.6	8.6	7.9	7.4
Bulls	8.4	8.2	8.6	7.6	7.6
Heifers	9.0	9.0	8.6	8.2	7.2

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	5244	5284	5345	5435	9156	9137
Location	Crossville	Crossville	Crossville	Crossville	Knoxville	Knoxville
Breed of sire	Angus	Angus	Angus	Angus	Hereford	Angus
Breed of dam	Angus	Angus	Angus	Angus	Hereford	Angus
No. cows bred	23	20	19	18	25	48
No. cows calving	17	16	16	15	21	41
No. cows raised	16	16	16	15	19	40
Av. inbr. of calves (%)	12	14	13		12	26
Av. birth date	3/3/58	3/2/58	3/12/58	2/18/58	3/14/58	3/5/58
Av. birth wt. (lbs):	62	71	70	59	68	61
Bulls	65	74	74	58	69	64
Heifers	57	68	64	61	67	59
Were calves creep fed?					No	No
Av. weaning age (days)	206	212	213	225	208	219
Bulls	210	213	208	222	210	213
Heifers	198	211	222	229	205	224
Av. weaning wt.:	443	454	482	458	426	422
Bulls	471	484	491	464	431	453
Heifers	388	423	461	448	418	400
Adjusted av. daily gain - birth to weaning	2.01	1.93	2.09	1.91	1.79	1.77
Av. weaning type score:	11.8	12.4	12.8	11.9	12.9	12.7
Bulls	12.1	12.0	12.5	12.1	12.6	12.9
Heifers	11.2	12.8	13.5	11.7	13.3	12.5
Av. weaning condition score:	9.4	10.0	10.2	10.2		
Bulls	9.4	8.9	9.8	9.4		
Heifers	9.5	11.0	10.9	11.3		

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	3369	3529	3586	3688	9011	9029
Location	Oak Ridge	Oak Ridge	Oak Ridge	Oak Ridge	Oak Ridge	Oak Ridge
Breed of sire	Hereford	Hereford	Hereford	Hereford	Hereford	Hereford
Breed of dam	Hereford	Hereford	Hereford	Hereford	Hereford	Hereford
No. cows calving	19	14	23	25	25	27
No. cows raised	18	12	22	21	23	24
Av. inbr. of calves (%)		11			22	23
Av. birth date	2/13/58	2/18/58	2/5/58	2/5/58	2/27/58	2/19/58
Av. birth wt. (lbs):	69	69	74	68	65	67
Bulls	73	71	76	70	65	70
Heifers	66	66	71	65	65	65
Av. weaning age (days)	222	218	229	229	207	218
Bulls	212	216	228	227	206	204
Heifers	228	225	232	232	209	228
Av. weaning wt.:	441	442	454	489	396	442
Bulls	446	457	470	498	398	437
Heifers	439	402	425	471	394	445
Adjusted av. daily gain - birth to weaning	1.87	1.78	1.76	1.93	1.76	1.88
Av. weaning type score:	10.4	10.0	10.5	11.1	10.4	11.1
Bulls	10.5	10.0	10.3	11.1	101 7	11.1
Heifers	10.3	10.0	10.8	11.2	10.0	11.2
Av. weaning condition score:	8.5	8.0	7.8	9.0	8.2	9.0
Bulls	8.4	8.0	7.6	8.5	8.3	8.6
Heifers	8.5	8.0	8.2	9.8	8.1	9.3

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation Location Breed of sire Breed of dam	9067 Oak Ridge Hereford Hereford	9307 Oak Ridge Hereford Hereford	9351 Oak Ridge Hereford Hereford	9508 Oak Ridge Hereford Hereford	9536 Oak Ridge Hereford Hereford	9983 Oak Ridge Hereford Hereford	9988 Oak Ridge Hereford Hereford
No. cows calving	25	21	25	27	25	21	23
No. calves raised	18	17	22	26	22	19	22
Av. inbr. of calves (%)	17	16	19	25	20	18	21
Av. birth date	2/10/58	2/16/58	3/10/58	3/22/58	3/7/58	3/19/58	3/9/58
Av. birth wt. (lbs):	66	63	61	68	64	66	58
Bulls	65	68	62	70	65	70	59
Heifers	67	61	60	65	63	61	56
Av. weaning age: (days)	226	224	201	183	206	192	199
Bulls	215	223	198	174	203	197	199
Heifers	240	225	202	203	212	186	198
Av. weaning wt.:	419	409	381	376	369	339	355
Bulls	379	407	355	363	373	347	353
Heifers	464	410	390	403	361	332	357
Adjusted av. daily - gain - birth to weaning	1.69	1.63	1.88	1.85	1.69	1.66	1.73
Av. weaning type score:	10.3	9.8	10.4	10.7	10.0	9.5	10.0
Bulls	9.6	9.5	9.6	10.5	10.4	9.5	9.9
Heifers	11.0	9.9	10.7	11.1	9.4	9.5	10.1
Av. weaning conditions core	8.7	8.3	8.2	8.2	7.6	7.1	7.2
Bulls	7.9	7.7	6.3	7.9	7.4	6.7	7.0
Heifers	9.7	8.6	8.9	8.9	7.9	7.5	7.5

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	6955	9197	1234	5133	9176	9295	9380	9385
Location	---Springfield---		----------Ames Plantation----------					
Breed of sire	Hereford	Hereford	Angus	Angus	Angus	Angus	Angus	Angus
Breed of dam	Hereford	Hereford	Angus	Angus	Angus	Angus	Angus	Angus
No. cows bred	13	20	18	21	24	28	29	20
No. cows calving	12	18	15	19	19	24	25	16
No. cows raised	10	14	14	17	17	23	25	14
Av. inbr. of calves (%)		13	12			20		13
Av. birth date	2/25/58	3/10/58	2/25/58	3/2/58	3/7/58	2/27/58	2/17/58	3/2/58
Av. birth wt. (lbs.)	62	59	58	59	62	60	54	56
Bulls	64	61	60	61	65	61	58	59
Heifers	57	54	56	58	58	58	52	53
Av. weaning date:	210	201	10/21/58	10/21/58	10/21/58	10/21/58	10/21/58	10/21/58
Bulls	204	190	10/21/58	10/21/58	10/21/58	10/21/58	10/21/58	10/21/58
Heifers	224	214	10/21/58	10/21/58	10/21/58	10/21/58	10/21/58	10/21/58
Av. weaning wt.: (lbs.)	474	407	434	398	446	462	464	412
Bulls	481	394	443	407	474	461	465	414
Heifers	457	422	428	392	421	463	464	408
Adjusted av. daily gain - birth to weaning	2.04	1.89	1.70	1.57	1.78	1.80	1.93	1.66
Av. weaning type score:	10.8	10.5	12.8	11.1	12.5	12.0	12.9	11.4
Bulls	11.4	10.5	12.1	10.6	12.3	11.8	12.1	11.0
Heifers	9.5	10.4	13.4	11.7	12.7	12.5	13.4	12.0
Av. weaning condition score:	8.5	8.8	10.1	8.7	9.7	9.2	10.1	9.2
Bulls	8.3	8.0	9.0	7.9	9.0	8.8	8.8	8.4
Heifers	9.0	9.7	10.9	9.4	10.2	10.3	11.0	10.1

Tenn

I. Project Title:

The Detection of Animals Heterozygous for Recessive Bovine Dwarfism. Hatch 65 (S-10) Coop ARS.

II. Objectives:

To investigate methods of identifying animals heterozygous for recessive bovine dwarfism.

III. Accomplishments During the Year:

(a) X-ray Studies. Radiographs of the lumbar vertebrae of approximately 100 calves were taken during the year. This brings the total number of calv X-rayed for this project to approximately 1,600. The cumulative results indicate the X-ray method may be evaluated as follows:

(1) Of 84 carriers produced by using a dwarf parent, or proven to be a carrier by a progeny test, 68 or 82 per cent were classified as B type.[1]

(2) Of 210 calves produced from pedigree clean Hereford matings, 61 per cent were classified as C type. The percentage of C X-rays from pedigree clean matings varied considerably from one herd to another.

(3) Most of the overlap between the X-ray classifications of pedigree clean and carrier animals was observed within the range of C to B_4 classifications.

(4) The X-ray method appeared less accurate in predicting the genotype of Angus progeny.

(5) Of approximately 50 Snorter dwarfs that have been X-rayed all have had extremely abnormal vertebrae, and with one exception all were classified as A type. The one exception had a B8 classification.

The radiographs of animals of known genotype were studied to find furthe diagnostic clues for detecting carriers. However, none of the characteristics studied proved helpful in identifying carriers.

(b) Blood Studies. The osmotic fragility of the red blood cells was studied as a possible indication of genotype for dwarfism. Blood samples were placed in 0.56% saline solution for 30 minutes and centrifuged. The amount of light transmission through the supernatent fluid was then used as a measure of the amount of hemolysis of the red blood cells. A total of 69 cows (36 pedigree clean and 33 carriers) were bled during a two-week period and six weeks later 61 cows (33 pedigree clean and 28 carri were bled during another two-week period. Fifty-three cows were includ in both groups. These results are given in Table I.

No consistent difference between genotypes was observed. However, the red blood cells from the yearling (18 months old) heifers and two year old cows showed more hemolysis than did the older cows. Also the older cows showed more variation in the fragility of their red blood cells th the younger cows did.

[1] The classification of X-ray photographs of lumbar vertebra ranged from "C" (normal) through "B1 to B8" (progressive degrees of abnormality) to "A" (typical abnormality observed in dwarfs).

During the first period determinations were made on each blood sample 2 and 6 hours after the blood sample was taken. The average hemolysis was essentially the same for the determinations at both times and the correlation between the two determinations on each sample was 0.99.

For the 53 cows which were bled twice the correlation between the average of the two determinations on the first sample and the reading on the second sample was 0.76.

(c) Other. A group of 30 pedigree clean Hereford cows was divided randomly into two groups of 15 cows each. One group was mated to a dwarf bull and the other group was mated to a pedigree clean Hereford bull. These matings were made to provide additional animals of known genotypes with which to do further dwarfism work.

IV. Future Plans:

(a) The herd of 30 cows will be maintained with one-half of the herd mated to a dwarf bull one year and to a pedigree clean bull the next year and the other half mated to a bull of the opposite genotype each year.

(b) Calves from the above matings will be X-rayed before two weeks of age and body measurements will be taken when X-rayed, when approximately 4 months old and at weaning.

(c) Radiographs will be taken of the purebred Hereford calves in several station herds to further evaluate the usefulness of X-rays as a means of maintaining a dwarf free herd of cattle.

(d) Various possible indicators of genotype will be tested on the animals of known genotype that are available.

V. Publications During the Year:

High, Joe W., Jr., H. J. Smith, C. S. Hobbs, and C. M. Kincaid. 1958. Evaluation of the X-ray Method of Detecting Animals Heterozygous for Snorter Dwarfism. J. Animal Sci. 17:1140 (abs.).

VI. Publications Planned:

High, Joe W., H. J. Smith, C. M. Kincaid and C. S. Hobbs. Evaluation of the X-ray method of Detecting Animals Heterozygous for Snorter Dwarfism. Has been submitted to Journal of Animal Science for Publication.

VII. Personnel active in Project:

R. J. Cooper, J. W. High, H. J. Smith, C. S. Hobbs and C. M. Kincaid.

Tex

TEXAS STATION

-by-
T. C. Cartwright

I. Project Title:

The Improvement of Production and Adaptation of Beef Cattle Within Pure Breeds and Certain of Their Crosses Through Breeding Methods. Texas 650 (S-10) Coop. ARS

II. Objectives:

a. The improvement of rate of gain of beef cattle by selection based on weaning weight and gain in the feed lot.
b. The improvement of rate of gain in the Brahman breed by crossing with the Hereford and backcrossing to the Brahman with recurrent selection.
c. To evaluate cattle with regard to adaptability to environment, especially during the summer months.
d. To improve production during the hot months by selection based on individual summer gain and other evaluation records.
e. To determine the magnitude of carcass differences within breeds and to determine the heritability of differences.
f. To evaluate new crosses and breeds with respect to carcass merit.
g. To determine the relative potential value of the carcasses of bulls culled from the project.
h. To evaluate the significance of hybrid vigor in hybrids and their offspring with regard to gaining ability, carcass value, fertility, adaptability and hardiness.
i. To make available breeding animals of proven superiority.

III. Accomplishments during the year:

A. Two gain tested Angus and one Hereford bull were purchased. One had a weaning weight of 575 (205-day adjusted) and gained 435 pounds per day on 140-day test. The second had a record of 535 pounds at weaning and 385 pounds per day on test. The Hereford gained 3.23 per day when tested at Balmorhea in 1950-51. The average of all of his sons which have been gain-tested (n=20) is 3.1 lbs. and 124 gain ratio.

The McGregor herd consists of approximately 400 breeding cows. Pasture, handling facilities, grain and forage supply are adequate for an increase of 100 to 200 cows. Gain testing facilities and feed supply are sufficient for about 500 cattle.

Approximately 200 grade Hereford cows located on the A and M Plantation (approximately 7 miles from A and M campus in the Brazos River bottoms) and sufficient pasture land and feeding equipment have been added to this project. The facilities also include equipment for collecting, freezing and storing semen and artificially inseminating the cows.

B. Research results:

Calving records from cows 3 years old and older over a five-year period representing 765 Hereford cow years, 244 Brahman cow years and 379 Hereford-Brahman (F_1's) cow years showed that the F_1's produced 14% more calves than the Herefords and 25% more than the Brahmans at

weaning. A comparison of the F_1's advantage over the Herefords indicated that approximately 13 percentage points are attributable to a higher calving percentage and 1 percentage point to lower mortality. The data from the Brahman cows, though probably somewhat biased, show approximately the same difference from the F_1's at calving but decrease approximately 12% more before weaning (mostly during the first 3 weeks). The smaller (birth weight) less vigorous (birth score) Brahman calves apparently are not as able to withstand January, February, and March calving in the open as either Herefords or the F_1's.

Complete slaughter and meats data have been obtained from 156 steers. Heritability of tenderness (shear force) was estimated by the half-sib method to be 64% when computed overall breeds and 48% when computed within breed of sire. The progeny from Brahman sires are considerably more variable and average somewhat tougher than the progeny from the Hereford sires (8.47 vs. 9.65 lbs. shear force for 1/2 inch cores). The correlation of shear-force value with gain per day of age was -.17 over all breeds. Shear force with gain on test was -.49 over all breeds and -.44 within breeds. The correlation between gain of sire and average shear of progeny was -.43 overall and -.20 within breeds.

One year's data analyzed separately indicated that tenderness was influenced by method of cooking but that choice of methods of cooking depended more on the muscle than on U. S. carcass grade, separable fat or ether extract (marbling). Collagen analysis on 26 animals showed that: biceps contains more collagen nitrogen than longissimus; muscle tissue broiled rare contains less collagen nitrogen than raw (25% less); the correlation coefficient for collagen nitrogen content vs. score for tenderness of connective tissue was -.87.

IV. Future Plans:

To continue present work.

V. Publications During the Year:

Cartwright, T.C.; Butler, O.D.; and Cover, Sylvia, 1958. Influence of Sires on Tenderness of Beef. Proc. X Research Conf. Am. Meat Inst. 75-79.

VI. Publications Planned:

Heritability of weaning wt. and genetic and environmental correlations between weaning weight and subsequent performance.

Maternal correction factors for Brahmans, Herefords, and the F_1 between them.

The repeatability of 28-day feed lot records.

Tex

PERFORMANCE OF COW HERDS. 1958 CALVES

Location*	Substation 23, McGregor, Texas							
Breed of sire	Hereford	Brahman	Angus	Charolaise	St. Gert.	Hereford	Hereford	Hereford
Breed of dam	Hereford	Brahman	Angus	Charbray	St. Gert.	Brahman	1x	3x 9x
No. cows bred	58	20	13	22	6	16	18	11
No. cows calving	51	19	9	18	5	10	18	10
No. calves raised	45	14	9	17	2	10	17	10
Av. birth date	2/18/58	3/1/58	1/15/58	2/20/58	4/4/58	3/9/58	2/14/58	2/12/58
Av. birth wt. (lbs):								
Bulls	80	72	58	90	41	66	73	85
Heifers	78	51	55	90	76	72	68	85
Were calves creep fed?	No	No	No	No	No	No	No	No
Av. weaning date:								
Bulls	8/17/58	9/4/58	6/15/58	8/12/58		3/29/58	8/23/58	7/30/58
Steers								
Heifers	8/15/58	8/29/58	6/25/58	8/6/58	10/29/58	9/12/58	8/5/58	9/5/58
Av. weaning wt.: 180 days								
Bulls	406	395	396	537		483	472	460
Steers								
Heifers	369	347	339	412	371	446	427	438
Adjusted av. daily gain - Birth to weaning	1.74	1.60	1.62	2.15	1.72	2.19	2.10	2.05

* All cows bred and calved at Substation 23, McGregor, Texas.

PERFORMANCE OF COW HERDS. 1953 CALVES

Location*	Substation 23, McGregor, Texas						
Breed of sire	Brahman	Brahman	Brahman	Charolaise	Charolaise	St. Gert.	St. Gert.
Breed of dam	Hereford	4x	1x	Hereford	1x	Hereford	1x
No. cows bred	16	17	17	5	8	4	13
No. cows calving	12	15	17	5	7	4	10
No. calves raised	12	14	17	3	6	4	10
Av. birth date	2/26/58	3/25/58	2/25/58	3/1/58	2/17/58	3/4/58	3/12/58
Av. birth wt. (lbs):							
Bulls	92	80	87	94	81	81	90
Heifers	90	65	67	78	83	75	72
Were calves creep fed?	No	No	No	No	No	No	No
Av. weaning date:							
Bulls	8/2/58	9/4/58	9/3/58	7/22/58	8/2/58	7/25/58	9/16/58
Steers							
Heifers	9/11/58	10/13/58	8/9/58	10/2/58	8/22/58	10/8/58	9/3/58
Av. weaning wt.: 180 days							
Bulls	455	438	460	517	495	465	477
Steers							
Heifers	384	390	401	444	453	352	435
Adjusted av. daily gain - birth to weaning	1.79	1.89	1.99	2.25	2.13	1.83	2.07

* All cows bred and calved at Substation 23, McGregor, Texas.

PERFORMANCE OF COW HERDS. 1958 CALVES

Location*	Substation 23, McGregor, Texas								
Breed of sire	St. Gert.	St. Gert.	St. Gert.	St. Gert.	St. Gert.	St. Gert.	1x	1x	1x
Breed of dam	11x	32x	13x	Red Poll	52x	14x	Hereford	Brahman	1x
No. cows bred	17	1	8	12	1	4	16	17	18
No. cows calving	15	1	5	12	1	3	15	17	15
No. calves raised	13	1	4	12	1	3	12	17	14
Av. birth date	2/26/58	3/22/58	4/3/58	3/21/58	5/12/58	2/1/58	2/22/58	3/10/58	2/22/58
Av. birth wt. (lbs)									
Bulls	73		79	98			85	81	81
Heifers	74	76	67	81	70	74	94	67	72
Were calves creep fed?	No	No	No	No	No	No	No	No	No
Av. weaning date:									
Bulls	9/1/58		10/15/58	10/3/58			8/15/58	9/4/58	8/6/58
Steers									
Heifers	8/22/58	9/18/58	9/3/58	8/18/58	11/8/58	7/31/58	8/21/58	9/13/58	9/5/58
Av. weaning wt.: 180 days									
Bulls	461		435	506			435	416	475
Steers									
Heifers	396	402	389	446	368	487	460	400	421
Adjusted av. daily gain - birth to weaning	1.95	1.81	1.94	2.09	1.66	2.29	1.90	1.86	2.06

* All cows bred and calved at Substation 23, McGregor, Texas.

Tex

I. Project Title:

Improvement of Beef Cattle Through Selection of Performance Tested and Progeny Tested Sires. Texas 607 (S-10) Coop. ARS

IIa. Objectives:

Balmorhea Location -- A. A. Melton

1. To determine heritability of gain and other economic characteristics as beef conformation, quality of flesh, earliness of maturity, and size of animal.
2. To study the effects of the application of such information on the improvement of breeding herds.
3. To determine the mode of inheritance of the pigmentation of eye lids and to determine the relationship of eye lid pigmentation to "cancer eye".
4. To make detailed analysis of appropriate existing data.
5. To determine suitable and economical rations of locally grown feeds and supplements for proper development of young breeding stock.

IIIa. Accomplishments During the Year:

A. A 24' trailer with a sloping bottom was built. Lying flat at the bottom of the bed, is a 25' elevator which carries alfalfa to an elevated elevator that carries the alfalfa to the feed mixer parked on the scales.
B. In the test for this past year were 65 bulls and 12 steers, which were half brothers to the bulls. The average daily gain for the bulls was 2.7 pounds, which was the highest average ever recorded at our station. Two Hereford bulls gained 3.5 pounds which was also the highest individual gain ever recorded here, and a sire group of nine, including these two, gained 3.1 pounds, and this also was a record for sire groups. The top 5 gaining individuals were from the top sire group of nine, and they were sired by a bull that finished the test in 1951 with a 3.2 pounds average daily gain. Both the sire and the progeny had a higher initial weight per day of age than the average of all bulls their respective year. The group of nine had an average adjusted 205-day weaning weight of 547 pounds, whereas the average for the 65 head was 480 pounds. This sire has sired the top individual and sire groups, plus a sire group of steers, in two previous tests.

The average daily gain for the seven year period 1946-1952 was 2.2 pounds. The average daily gain for the last seven years, 1953-1959, is 2.4 pounds. The quality, or grade, of the bulls has also improved. In 1953, 40 percent of the bulls graded below choice whereas last year only 20 percent graded below choice.

IVa. Future Plans:

Unknown at time of writing.

V.a. Publications:

Melton, A. A. and John H. Jones, Beef Cattle Performance and Progeny Tests, Balmorhea Station, 1956-57 and 1957-58. Texas Agricultural Experiment Station, P. R. 2044.

Melton, A. A., Monthly Test Reports and Field Day Report. February 28. 1959.

McGregor Location -- W. E. Kruse

IIIb. Accomplishments During the Year:

A. No new facilities.

B. Two tests were conducted in which 376 cattle were tested. Of these, 128 belonged to cooperators and 248 to the station. Pasture gain test trials were conducted at McGregor and at a location (Luling) cooperating with the McGregor Station.

At McGregor, 28 steers were split into two groups of 11 and 17 each. The group of 11 was fed a concentrate ration in the feed lot and the other group was pastured on oats, Johnson-grass and hubam clover without supplementation other than minerals. The gains were 343 pounds for the pasture steers vs. 304 pounds for the feed lot. Finish scores, 66 vs. 61, were somewhat better for the feed lot group. The two groups were not balanced and the difference between groups is somewhat confounded with other effects.

At the Luling location, groups of heifers equalized by weight, grade and sires were used in the pasture gain testing trials for two years. The pasture heifers had access to a concentrate mixture and ate 11.1 pounds daily the first year and 13.4 pounds the second year vs. 20.5 and 20.7 pounds respectively for the feed lot heifers.

The gains were as follows:

		Feed Lot			Pasture		
Year	Sire	No.	Lbs. Gain	Rank (Yr.)	No.	Lbs. Gain	Rank (Yr.)
1957-58	Y	3	250	1	3	294	1
"	S	3	243	2	3	268	2
"	W	3	240	3	4	267	3
"	L	2	232	4	2	265	4
Ave.	4	11	241	-	12	274	-
1958-59	519	2	280	1	2	290	1
"	215	3	232	2	3	266	3
"	365	2	225	3	2	262	4
"	344	4	221	4	3	252	5
"	346	3	205	5	3	213	6
"	518	3	195	6	3	272	2
Ave.	---	17	223	-	16	257	-

IVb. Future Plans:

More pasture gain testing trials will be conducted. Gain testing will be continued for the breeding herd and for cooperators whose cattle fit special requirements.

Vb. Publications:

Cartwright, T. C., 1958. Beef Cattle Gain Evaluation Test Reports. Texas Agricultural Experiment Station. Misc. Publications 233 and 258.

VIb. Publications planned:

Reports for 1958-59 and 1959-60 gain tests.

IIc. Objectives:

PanTech Location -- G. W. Ellis, Jr.

1. To compare the gaining ability of bulls from different sources when they are fed the same ration under uniform conditions.
2. To determine the relationships that exist among the following characteristics:
   a. Gain on 140 day feed test.
   b. Weaning weight adjusted to 205 days of age.
   c. Actual weaning weight.
   d. Gain from weaning to start of test.
   e. Initial test weight.
   f. Efficiency of feed utilization during 140 day feed test.
3. To develop a method of evaluating and selecting superior sires, based on the information given above.

IIIc. Accomplishments During the Year:

A. Facilities: The facilities include a feed mixing plant, sale barn, and pen for 160 bulls.
B. Research results: 119 bulls on test averaged 2.52 lbs. per day on 140 day test. Phenotypic correlations obtained from the 1957-58 data are listed below.

140-Day Gain vs.:	Correlation coef.
Initial age	.1635 n.s.
Initial weight	.2500 * *
Initial wt/day age	.1268 n.s.
Final conformation score	-.0873 n.s.
Adj. weaning wt.	.1674 n.s.
Gain, weaning to start of test	-.4138 * *
Initial age and initial wt. (R)	.2547

Ave. feed/cwt. of sire group vs:	Correlation coef.
Ave. initial wt. of sire group	.8311 * *
Ave. initial age of sire group	.7365 * *
Ave. 140-day gain of sire group	-.5769
Ave. initial age and ave. initial wt. of sire group (R)	.8383

Tex

IVc. Future Plans:

Continue with added emphasis on weaning weights.

Vc. Publications:

1957-1958 Beef Cattle Improvement Investigations (Field Day Report)

VIc. Publications Planned:

We plan to put out a miscellaneous publication on the effect of weaning weights and pre-test gains on gain test.

SOME FACTORS INFLUENCING VARIATION IN 28-DAY GAINS OF FEED-LOT CATTLE
(Supplementary Texas Station Report)

Weights were taken of 2420 bulls, heifers and steers, fed on 140-day gain tests from 1952 through 1958, on two consecutive days at the beginning and at the end and once every 28 days. Years were grouped according to the weighing technique: (I) no shrink, (II) overnight feed and water shrink and (III) overnight feed and water shrink at beginning and end only. Repeatabilities of 28-day gain, within sex and breed, for each year - group ranged from-.13 to -.03, indicating large individual variance relative to variance among animals. Repeatabilities for beginning and end weights were all above .98. Periodic gains tended to be cyclic or compensatory. The relatively large variance of gains of individuals appears to be caused by periodic differences in tissue gain as well as by transient day-to-day differences in fill. Variances associated with bulls were larger, but the coefficients of variability were smaller. Within animal variances were significantly lower in year group I than in II and III for gains but higher for consecutive-day weights. Among animal variances followed the same trend for Herefords, Brahmans and the F_1's between them but the trend was the same with respect to year group. Gain in each of the five 28-day periods was slightly negatively correlated (-.10 to -.02) with gainn in the subsequent 28 days but all were positively correlated (.44 to..55) with total gain. The correlation of accumulated gain with total gain increased as periods progressed as follows: .50, .73, .84 and .91.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Location	-----Substation 23, McGregor, Texas---------							
Breeding of calves	Hereford		Brahman		Angus		Charolais	
	BF	Coop.	BF	Coop.	BF	Coop.	BF	Coop.
Bulls, No.	13	26	19	2	5		3	
Av. weaning wt. (lbs)*	370		400					
Av. initial age (days)	292		272		294		288	
Av. initial wt. (lbs)	535		485		600		830	
Length of feeding period** (days)								
Av. daily gain (lbs)	2.3		2.1		1.9		2.6	
Av. score type conditions (1)	56		47		57		60	
Feed per cwt. gain (lbs)***								
Concentrates 35%								
Roughage 65%								
Steers, No.	8 (2)							
Av. weaning wt. (lbs)*	361							
Av. initial age (days)	251 (276)							
Av. initial wt. (lbs)	461 (419)							
Length of feeding period** (days)								
Av. daily gain (lbs)	2.3 (2.5)							
Av. score type conditions(1)	62 (5.4)							
Feed per cwt. gain (lbs)***								
Concentrates 70%								
Roughage 30%								
Heifers, No.	18	8	15		1	3		12
Av. weaning wt. (lbs)	367		368		355			
Av. initial age (days)	279		261		305		288	
Av. initial wt. (lbs)	491		444		474		653	
Length of feeding period** (days)								
Av. daily gain (lbs)	1.8		1.6		1.6		1.9	
Av. score type conditions(1)	62		48		60		59	
Feed per cwt. gain (lbs)***								
Concentrates 35%								
Roughage 65%								

* Weaning Weight age 180 days, BF calves only.

** 140 days

*** Feed per cwt. gain (lbs)
Bulls - 943, Steers - 1163,
Heifers - 968

(1) Cond. or degree of fleshing code
10 - 30 thin
40 - 60 medium
70 - 90 fat

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Location Breeding of calves	Substation 23, McGregor, Texas St. Gert. Coop.	 Charbray BF Coop.	 Red Poll Coop.	 Sussex Coop.
Bulls, No.	54	3 5	2	2
Av. weaning wt. (lbs)*		531		
Av. initial age (days)	314	287	290	293
Av. initial wt. (lbs)	698	731	622	828
Length of feeding period (days)				
Av. daily gain (lbs)	2.5	2.7	1.9	2.2
Av. score type conditions(1)	55	54	40	68
Feed per cwt. gain (lbs)***				
Concentrates 35%				
Roughage 65%				
Steers, No.				8
Av. inbreeding (%)				
Av. weaning wt. (lbs)*				
Av. initial age (days)				399
Av. initial wt. (lbs)				716
Length of feeding period (days)				
Av. daily gain (lbs)				2.3
Av. score type conditions(1)				72
Feed per cwt. gain (lbs)***				
Concentrates 70%				
Roughage 35%				
Heifers, No.	29	4 10		
Av. weaning wt. (lbs)*		500		
Av. initial age (days)	309	306		
Av. initial wt. (lbs)	588	623		
Length of feeding period** (days)				
Av. daily gain (lbs)	1.9	1.8		
Av. score type conditions(1)	59	57		
Feed per cwt. gain (lbs)***				
Concentrates 35%				
Roughage 65%				

*Weaning wt. age 180 days, BF calves
**140 days
***Feed per cwt. gain (lbs.)

(1) Condition or degree of fleshing code
10 - 30 thin
40 - 60 medium
70 - 90 fat-

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING

Location	Substation 23, McGregor, Texas											
Breeding of calves	Hereford		Brahman		Angus		Charolais	St. Gert.	Charbray		Red Poll	
	BF	Coop.	BF	Coop.	BF	Coop.	Coop.	Coop.	BF	Coop.		Coop.
Bulls, No.	13	26	19	2		5	3	54	3	5		2
Av. weaning wt. (lbs)*	370		400						531			
Av. initial age (days)	292		272		294		288	314	287		290	
Av. initial wt. (lbs)	535		485		600		830	698	731		622	
Av. daily gain (lbs)	2.3		2.1		1.9		2.6	2.5	2.7		1.9	
Av. score type conditions(1)	56		47		57		60	55	54		46	
Feed per cwt. gain (lbs)***												
Concentrates 35%												
Roughage 65%												
Steers, No.	8 (2)											
Av. weaning wt. (lbs)*	361											
Av. initial age (days)	251 (276)											
Av. initial wt. (lbs)	461 (419)											
Av. daily gain (lbs)	2.3 (2.5)											
Av. score type conditions(1)	62 (5.4)											
Feed per cwt. gain (lbs)***												
Concentrates 70%												
Roughage 30%												
Heifers, No.	18	8	15		1	3	12	29	4	10		
Av. weaning wt. (lbs)*	367		368		355				500			
Av. initial age (days)	279		261		305		288	309	306			
Av. initial wt. (lbs)	491		444		474		653	588	623			
Av. daily gain (lbs)	1.8		1.6		1.6		1.9	1.9	1.9			
Av. score type conditions	62		48		60		59	59	57			
Feed per cwt. gain (lbs)												
Concentrates 35%												
Roughage 65%												

* Weaning Weight age 180 days, BF calves only.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Location	Substation 23, McGregor, Texas						
Breeding of calves	Sussex Coop.	Beefmaster Coop.	Brangus Coop.	Red Angus Coop.	1 Cross BF	4 Cross BF	5 Cross BF
Bulls, No.	2	6	3	2			
Av. initial age (days)	223	290	270	236			
Av. initial wt. (lbs.)	828	719	591	616			
Av. daily gain (lbs)	2.2	2.0	1.9	1.9			
Av. score type conditions(1)	68	58	57	50			
Feed per cwt. gain (lbs)***							
Concentrates 35%							
Roughage 65%							
Steers, No.	8				5 (2)	16 (5)	5
Av. weaning wt. (lbs)*					450	454	441
Av. initial age (days)	399				248 (308)	248 (308)	251
Av. initial wt. (lbs)	716				461 (631)	528 (561)	560
Av. daily gain (lbs)	2.3				2.4 (2.7)	1.8 (2.2)	2.2
Av. score type conditions(1)	72				64 (67)	58 (60)	65
Feed per cwt. gain (lbs)***							
Concentrates 70%							
Roughage 30%							
Heifers, No.					3	23	2
Av. weaning wt. (lbs)*					431	431	420
Av. initial age (days)					259	274	244
Av. initial wt. (lbs)					518	515	525
Av. daily gain (lbs)					1.9	1.7	1.7
Av. score type conditions(1)					60	54	65
Feed per cwt. gain (lbs)***							
Concentrates 35%							
Roughage 65%							

* Weaning weight age 180 days, BF calves only.

*** Feed per cwt. gain (lbs:): Bulls - 943, Steers - 1163, Heifers - 968.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Location Breeding of calves	Substation 23, McGregor, Texas 11 cross BF	 13 cross BF	 15 cross BF	 16 cross BF	 23 cross BF
Steers, No.	2	(1)	(1)		2 (3)
Av. weaning wt. (lbs)*	485	407	558		395
Av. initial age (days)	248	(300)	(334)		244 (269)
Av. initial wt. (lbs)	566	(550)	(812)		527 (472)
Av. daily gain (lbs)	2.5	(2.2)	(2.8)		2.3 (2.1)
Av. score type conditions(1)	68	(63)	(70)		60 (57
Feed per cwt. gain (lbs)***					
Concentrates 70%					
Roughage 30%					
Heifers, No.	6	1	3	2	5
Av. weaning wt. (lbs)	402	409	415	501	395
Av. initial age (days)	259	266	300	248	263
Av. initial wt. (lbs)	509	542	571	605	505
Av. daily gain (lbs)	2.1	2.6	2.2	1.9	1.6
Av. score type conditions	63	57	57	58	53
Feed per cwt. gain (lbs)					
Concentrates 35%					
Roughage 65%					

* Weaning weight age 180 days, BF calves only

*** Feed per cwt. gain (lbs.): Bul s - 943, Steers - 1163, Heifers - 968.

(1) Condition or degree of fleshing code: 10 - 30 thin, 40 - 60 medium, 70 - 90 fat.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Location	Substation 23, McGregor, Texas					
Breeding of calves	32 cross BF	42 cross BF	51 cross BF	61 cross BF	95 cross Coop.	96 cross Coop.
Steers, No.	3 (1)		2 (2)		3	
Av. weaning wt. (lbs)*	397		494			
Av. initial age (days)	250 (299)		248 (292		255	
Av. initial wt. (lbs)	475 (561)		524 (655)		618	
Av. daily gain (lbs)	2.5 (2.6)		2.3 (3.2)		1.8	
Av. score type conditions(1)	60 (53)		60 (70)		51	
Feed per cwt. gain (lbs)						
Concentrates 70%						
Roughage 30%						
Heifers, No.	3	1	1	2		1
Av. weaning wt. (lbs)*	419	355	426	481		
Av. initial age (days)	278	315	267	260	236	
Av. initial wt. (lbs)	554	519	546	594	565	
Av. daily gain (lbs)	2.0	2.3	1.8	1.8	1.7	
Av. score type conditions***	69	63	60	63	55	
Feed per cwt. gain (lbs)						
Concentrates 35%						
Roughage 65%						

* Weaning weight age 180 days, BF calves only.
*** Feed per cwt. gain (lbs.): Bulls - 943, Steers - 1163, Heifers 968
(1) Condition or degree of fleshing code: 10 - 30 thin, 40 - 60 medium, 70 - 90 fat.

Tex

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Location Breeding of calves	Balmorhea, Texas		
	1958-59	1957-57	1957-58
Bulls, No.	65	60	
Av. weaning wt. (lbs) 205-D	480		
Av. initial age (days)	281	261	
Av. initial wt. (lbs)	599	557	
Length of feeding period (days)	140	140	
Av. daily gain (lbs)	2.7	2.4	
Av. score type conditions	65 choice	62	
Feed per cwt. gain (lbs)	900	840	
Concentrates	400	255	
Roughage	500	585	
		Grain R.	Roughage R.
Steers, No.	12	20	12
Av. weaning wt. (lbs) 205-D	434		
Av. initial age (days)	234		
Av. initial wt. (lbs)	458	529	549
Length of feeding period (days)	220	214	214
Av. daily gain (lbs)	2.2	2.08	1.92
Av. score type conditions	6.1	6.7	6.5
Feed per cwt. gain (lbs)	963	826	955
Concentrates	516	466	309
Roughage	447	360	646

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Line or group designation	Bulls on 1957-58 Test (Project 607)	
Location	--PanTech Farms, Texas--	
Breeding of calves	Hereford	Angus
Bulls, No.	112	4
Av. weaning wt. (lbs)*	461	527
Av. initial age (days)	305	223
Av. initial wt. (lbs)	615	503
Length of feeding period (days)	140	140
Av. daily gain (lbs)	2.53	2.33
Av. score type**	7.46	7.50
Feed per cwt. gain (lbs)	1045	941
Concentrates	348	314
Roughage	697	627

* 205 day adjusted for age of dam.

** 9 = Fancy, 8 = Fancy minus, 7 = Choice, 6 = Choice minus, 5 = Good.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)
PROJECT S-1129

Line or group designation				
Location	Old A Herd	Old B Herd	Old C Herd	Old F Herd
	----------	Pan Tech Farms, Texas	----------	
Steers, No.	3	3	3	3
Av. weaning wt. (lbs)	503	513	516	472
Av. initial age (days)	259	284	275	281
Av. initial wt. (lbs)	508	553	533	498
Length of feeding period (days)	248	248	248	248
Av. daily gain (lbs)	2.19	2.37	2.10	2.24

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1958

Line or group designation		Coop.				
Location	Substation 23, McGregor, Texas					
Breeding:	Hereford	Sussex	1 cross	4 cross	5 cross	11 cross
Sex:	Steers	Steers	Steers	Steers	Steers	Steers
No. () Grazed on oat pasture.	7 (2)	8	5 (2)	15	5	2
Av. wt. (1)	764		1012			
Av. gain on pasture	345		381			
Av. wt. adjusted to 18 or 30 months of age(1)	793	1041	874	795	905	942
Av. gain on feed	323	325	328	251	332	341
Animals slaughtered: Averages at slaughter						
Age (days)	404	549	415	393	401	398
Weight	741	977	868	741	849	870
Dressing percent	58.64	58.57	61.04	61.82	58.91	61.00
Carcass grade	Good -	Good -	Good -	Standard+	Good -	Standard+

(1) Average weight at the end of the 140 day feeding or grazing period.

(2) Days on feed - 140
Grazing on oat pasture.
Av. daily gain 2.8
140 day gain 395.

(3) Days on feed - 140, Self-fed

Fattening Ration

60% - Ground milo
10% - Cottonseed meal
30% - Ground oat-clover and Sudan hay.

Av. Day Ration 22 lbs.
Feed per cwt. 1163 lbs.
Av. daily gain 2.2
140 day gain - 301

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1958

Line or group designation					Coop
Location	---------Substation 23, McGregor, Texas---------				
Breeding:	15 cross	23 cross	32 cross	51 cross	95 cross
Sex:	Steers	Steers	Steers	Steers	Steers
No. Grazed on oat pasture.	(1)	2	3	2 (2)	3
Days on pasture(2)					
Av. wt.	1210			1105	
Av. gain on pasture	397			450	
Av. wt. adjusted to 18 or 30 months of age(1)		829	837	937	888
Av. gain on feed		313	355	320	246
Animals slaughtered: Averages at slaughter					
Age	484	394	400	420	405
Weight	1140	782	775	953	808
Dressing percent	62.50	61.40	59.34	59.82	58.49
Carcass grade	Standard+	Standard+	Good-	Standard+	Standard+

(1) Average weight at the end of the 140 day feeding or grazing period.

(2) Days on feed - 140
Grazing on oat pasture.
Av. daily gain 2.8
140 day gain 395.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1958

Line or group designation	1957-58	1957/58	Old A Herd	Old B Herd	Old C Herd	Old F Herd
Location	--Balmorhea, Texas--		----------PanTech Farms, Texas----------			
Breeding:			Hereford	Hereford	Hereford	Hereford
Sex:			Steers	Steers	Steers	Steers
No.			5	7	6	4
Av. age (fall 1957)			260	286	276	278
Av. wt. (fall 1957)			517	540	534	505
Days on pasture			----------113 days on wheat pasture----------			
Av. gain on pasture			1.69	1.56	1.42	1.50
Days on feed			----------162 days in feed lot----------			
Av. gain on feed			2.30	2.12	2.15	1.90
Animals slaughtered: Averages at slaughter	Grain R.	Roughage R.				
Age (days)	545	545	535	561	551	553
Weight	978	958	1080	1059	1043	982
Dressing percent	62.26	60.80	62.4	60.1	61.0	62.4
Carcass grade	Good +	Good	4 Choice 1 Good	4 Choice 3 Good	6 Good	1 Choice 3 Good

I. Project Title: Pan Tech Station

A Comparison of the Performance of Beef Cattle Selected by four Different Criteria. State project no. S-1129

II. Objectives:

1. To compare the performance, as measured by weaning weight and grade, stocker gain and grade, feedlot gain and grade, and carcass characteristics, of four beef cattle herds selected as follows:
   a. An A Herd in which herd sires and replacement heifers are selected by giving equal emphasis to conformation and gaining ability.
   b. A C Herd in which herd sires and replacement heifers are selected by visual appraisal, using current show ring standards of conformation.
   c. A B Herd in which herd sires and replacement heifers are selected on gaining ability.
   d. An F Herd in which herd sires and replacement heifers are selected for low gaining ability.
2. To determine the relationships that exist among the above-mentioned characteristics in beef cattle.

III. Accomplishments During the Year:

A. Facilities and cattle: Approximately 2000 acres of grassland and 100 head of Hereford grade cows are involved in this project.
B. Research results: Since we have had only one calf crop under the new project, only the limited data presented in the summary are available.

IV. Future Plans:

We plan to continue on the present basis for several years until we have sufficient data to make valid conclusions.

V. Publications:

None.

VI. Publications Planned:

When sufficient data are available, we shall publish the results in progress report form.

PERFORMANCE OF COW HERDS. 1958 CALVES
PanTech Farms Station

Location	A Herd	B Herd	C Herd	F Herd
	PanTech Farms, Texas			
Breed of sire	Hereford	Hereford	Hereford	Hereford
Breed of dam	Hereford	Hereford	Hereford	Hereford
No. cows bred	25	25	25	25
No. cows calving	21	24	22	22
No. calves raised	19	23	22	22
Were calves creep fed?	No	No	No	No
Av. weaning wt.:				
Bulls				
Steers	449	491	509	428
Heifers	419	451	470	430
Av. weaning type score:				
Bulls				
Steers	7.11	7.33	7.77	7.08
Heifers	7.70	7.27	7.91	7.56

TEXAS STATION

-by-
H. O. Kunkel

I. Project Title:

Methods for Measuring Potential Rate of Gain and Efficiency of Feed Utilization in Immature Beef Cattle. Anim. Husb., Biochem. and Nutr. 714 (S-10) Coop. ARS

II. Objectives:

(a) To develop methods of a biochemical or physiological nature which will measure the potential rate of gain in immature beef animals.
(b) To develop methods of measurement of the potential efficiency of utilization of feed for building body tissue.

III. Accomplishments During the Year:

The research results obtained prior to and during the early part of 1958 were promising, indicating that variations in abilities to gain were reflected in physiological differences. The results, however, did not readily show that an effective measurement of potential capacities could be made from the measurements thus far made of blood constituents. The concentrations of serum protein-bound iodine (PBIO), serum proteins, erythrocyte gluthathione (GSH) and serum phosphatases were related to some extent to the gaining patterns of young beef animals, but the coefficients of regression were variable in extent, in significance, and, at times, in sign.

During the past year, the research has been redirected into two principal but interrelated lines of research: (a) the study of interrelationships among various blood constituents and (b) a study of basic biochemical and physiological changes occurring with growth and development of cattle and other animals.

Interrelationships of Blood Constituents

A number of relationships were tested by statistical evaluation of previously accumulated data in addition to new measurements of blood constituents. Of principal significance were findings which indicated that the interpretation of the level of serum PBI is dependent upon the level of an as yet unidentified protein fraction in the serum. In young Angus (other breeds are yet to be tested sufficiently) the GSH of the erythrocyte varies in concentration with the apparent "active" PBI concentration in the serum. Thus accounted for is the fact that multiple coefficients of correlation involving GSH and PBI are not much higher than coefficients of correlations wherein either GSH or PBI, was omitted from consideration.

Similarly the serum oxidase activity (ceruloplasmin) is related to general variations in the various globulins of bovine sera (see Table 1 a).

Changes with Growth

Ceruloplasmin, a copper containing protein with electrophoretic mobility coincident with alpha-globulin, was purified from cattle serum. The protein can be determined directly chemically or from oxidative activity. Since ceruloplasmin represents a single readily identifiable component of serum proteins, a study of its variation with age was chosen as a model system with the hope that principles could be established in the calculation of other interrelationships.

Analyses of data collected at the beginning of an experiment with 8 six-months old heifers of 2 breeds (Hereford and Angus) indicated a significant positive relationship (Table 1a) between the globulins and ceruloplasmin levels; but with increasing age, the significant relationship diminished. Over the entire period, however, ceruloplasmin contents of the sera decreased with age while the globulin contents increased. Thus from a determinative standpoint the ceruloplasmin probably varies with factors which cause day to day variations in globulins. The positive correlation of serum albumin and erythrocyte GSH (Table 1b) suggest the ceruloplasmin, chemically an -globulin, may be closely related to the metabolism of the albumin and erythrocyte GSH. Thus ceruloplasmin and the various serum proteins may serve as more exact parameters in evaluating blood constituents than the absolute values previously used in calculations of relationships to the potential rate of gain in young beef animals.

Table 1a. Coefficients of Correlations Between Serum Ceruloplasmin[a/] and Globulin Within Age Groups of Beef Cattle.

Age and description	n	r
Aged females (5 yrs.)	24	0.56**
6 mo. females	8	0.66*
8 mo. females	8	0.39
12 mo. females	8	0.20
14 mo. females	8	0.50

a/ Determined by oxidation of N,N^{1}-dimethyl- p - phyenylenediamine.

Table 1b. Coefficients of Correlation Between Serum Ceruloplasmin and Various Serums, Proteins and Erythrocyte Glutathione as Animals Aging From 6 to 14 Months.

Variable	Hereford	Angus	Both breeds
% Globulin[a/]	-0.44**	-0.52**	-0.46**
% -globulin[a/]	-0.34*	-0.49**	-0.39**
% -globulin[a/]	-0.42**	-0.36*	-0.39**
% albumin[a/]	0.52**	0.44**	0.46**
Total albumin	0.47**	0.90**	0.57**
Erythrocyte GSH[b/]	0.57**	0.42**	

a/ Arc sine transformations

b/ Simple correlation for both breeds not calculated since GSH, in Angus is significantly higher than GSH, in Herefords.

For the investigation of basic biochemical and physiological changes occurring with growth and development, emphasis was shifted to species other than cattle. The stimulus for the inclusion of such research in this program lay in the desirability of gaining information in shorter time and with larger numbers of animals than possible with beef cattle.

Analyses by logarithmic heterogonic or allometric growth formulas revealed that the pattern of net synthesis of GSH by the developing chick embryo is in part under genetic control. Interbreed comparisons between the New Hampshire and White Leghorn embryos suggest that the pattern of GSH synthesis is predictive of the rate of post-hatching growth as well as the concentration of glutathione in the mature bird. The accumulative evidence obtained with both poultry and beef cattle indicate that the glutathione levels of various tissues are related to animal growth and development perhaps as much as any biochemical thus far investigated.

The investigation of the relationship of the anatomical development of the ruminoreticulum and the rate of gain has been initiated with sheep. Significant positive coefficients of correlation of rumen weight and measurements of papillary development in the rumen indicate a high order of relationship to the rate as well as the extent of growth and development of lambs. In rumen papillae, there appears to be a morphological expression of the rate of gain and possibly of the potential rate of gain.

Preliminary evidence indicates that certain lambs placed in a feed lot with a relatively high concentrate pelleted feed varied greatly in their acceptance of the feed and this acceptance appears to be related directly to the development of the rumen mucosa. All of these animals, however, readily consumed a high roughage diet. A possible implication is that variations in feedlot gain of ruminants may be dependent upon ruminal development, especially when higher acid producing high concentrate diets are fed. The genetic basis for this variation has not been ascertained.

IV. Future Plans:

Future plans are that the research continue to be oriented to study the basic changes occurring with growth until adequate fundamental knowledge will permit the development of predictors of future growth. Specific emphasis will be placed upon qualitative and quantitive relationships of ruminal development to growth patterns in beef cattle and sheep.

V. Publications:

Stutts, E. C., and H. O. Kunkel. Reduced glutathione concentration in relation to age and weight of New Hampshire and White Leghorn embryos. Poultry Sci. 37: 914 (1958).

Kunkel, H. O. Reduced glutathione of erythrocytes and the physiological significance of protein-bound iodine levels of bovine sera. Int. Abs. Biol. Sci., IV Int. Cong. Biochem. Suppl: 165 (1958).

Kunkel, H. O., and G. G. Green. The relationship of serum proteins to rate of gain in immature beef cattle. J. Anim. Sci. 17:1148 (1958). Abstract.

Sinclair, J. H., J. D. Robbins, F. E. Tutt, T. D. Watkins, Jr., and H. O. Kunkel. Variation in development of rumen papillae in sheep receiving a constant diet. J. Anim. Sci., 17:1220 (1958) Abstract.

Deyoe, C. W., and H. O. Kunkel. Variation in capacities of bovine sera to oxidize N, N^1- dimethyl -p-phenylenediamine. Fed. Proc., 18:214 (1959).

Green, G. G. The level of serum protein-bound iodine, its repeatability and relationship to rate of gain in immature beef cattle. Ph.D. Dissertation, A and M College of Texas, 1958.

VI. Publications Planned:

Sinclair, J. H., and H. O. Kunkel. Variation in post-weaning development in lambs.

I. Project Title:

Biochemical and Physiological Anomalies of Bovine Dwarfism and Their Use in Detection of Heterozygotes. Biochem. and Nutr., Anim. Husb. 959. (S-10) Coop. ARS

II. Objectives:

(a) The detection of biochemical or physiological anomalies which may be associated with bovine dwarfism of various types, with an attempt to identify the metabolic defects which cause dwarfism.

(b) The determination of the usefulness of biochemical or physiological anomalies, which may be detected in dwarfs, in the detection of the heterozygotic phenotypically normal animals.

III. Accomplishments During the Year:

Further work with the insulin stress test has shown little other than individual variation in white cell counts, and therefore research on formed bodies was discontinued during the year.

With a working hypothesis that a deranged carbohydrate metabolism is related to the dwarfism characteristic, research was directed to an investigation of the oxidative pathways involving glucose and glucose derivatives within the erythrocytes. Of a number of tests performed, the major point of difference appears to be in the metabolism of triphosphopyridine LC nucleotide as a coenzyme in hexose monophosphate shunt reactions. At present the differences are only of a statistical nature. The exact site of the biochemical alteration has not been identified.

IV. Future Plans:

Research will be continued in an effort to identify the primary reason for the apparent biochemical difference between normal and dwarf animals.

V. Publications:

Deyoe, C. W., M. C. Shrode and H. O. Kunkel. Physiological responses to insulin-induced stress in dwarf, dwarf carrier and normal beef cattle. J. Anim. Sci. (in press)

VI. Publications Planned:

None.

Virginia Station
-by-
J. A. Gaines

Va

I. Project title:

Heterosis from crosses among British breeds of beef cattle.
Hatch 93901 (S-10) Coop. ARS

II. Objectives:

(1) To measure heterosis obtained from crosses among Angus, Hereford and Shorthorn beef cattle as shown by growth rate, fattening ability, and carcass quality up to approximately two years of age.

(2) To measure productive ability of dams.

III. Accomplishments During the Year:

(1) Facilities and cattle acquired:
(a) Weaned 92 calves.
(b) Transferred 11 calves from Front Royal.

(2) Research results:
(a) Completed slaughter and summary of data on first calf crop, 1957 calves, (Table 1).
(b) Weaned second calf crop (Table 2).

IV. Future Plans:

(1) Heifers from second calf crop will be slaughtered in May, 1959.

(2) Steers from second calf crop will be slaughtered in February, 1960.

(3) Third calf crop will be weaned in September or October, 1959.

(4) Breeding for fourth calf crop will begin in May, 1959.

V. Publications During the Year:

(1) Gaines, J. A., R. C. Carter and C. M. Kincaid. 1958. Heritability of TDN/cwt. gain in beef cattle that are full fed. (abstract) Jour. Animal Sci. 17:1142.

(2) Turner, E. C., Jr. and J. A. Gaines. 1958. Systemic insecticides for control of cattle grubs in Virginia. Jour. Econ. Entomology 51:582-585.

VI. Publications Planned:

(1) An article in the Journal of Animal Science giving estimates of genetic parameters concerned with TDN/cwt. gain in full fed cattle.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Breeding of calves	Purebred	2-breed cross	3-breed cross	Backcross
Location	---------Blacksburg, Virginia---------			
Steers, No.	12	9	12	12
Av. weaning wt. (lbs)	315	335	367	342
Av. initial age (days)	554	556	590	571
Av. initial wt. (lbs)	736	795	804	772
Length of feeding period (days)	150	150	150	150
Av. daily gain (lbs)	1.94	2.08	2.05	1.98
Av. score type conditions	10.6	11.3	11.2	11.4
Av. carcass grade	11.4	11.5	11.8	11.5
Av. dressing percent	60.13	59.78	60.32	60.26
Av. loin eye area	10.56	11.99	11.65	11.31
Location	----Shenandoah Valley Research Station			
Heifers, No.	10	14	13	10
Av. weaning wt. (lbs)	310	314	353	313
Av. initial age (days)	198	200	234	215
Av. initial wt. (lbs)	310	314	353	313
Length of feeding period (days)	198 247	198 247	198 247	198 247
Av. daily gain (lbs)	1.71	1.80	1.86	1.93
Av. score type conditions	11.9	12.4	12.5	11.7
Feed per cwt. gain (lbs)				
Concentrates	598	568	576	527
Roughage	461	435	417	405
Av. carcass grade	11.5	11.7	12.8	12.0
Av. dressing percent	57.80	57.86	57.98	57.56
Av. loin eye area	7.97	8.53	9.91	9.09

PERFORMANCE OF COW HERDS
Shenandoah Valley Research Station

Line or group designation	Purebred	2-breed cross	3-breed cross	Backcross
Location		S. Tavern		
No. cows bred	30	30	30	30
No. cows calving	26	25	26	27
No. calves raised	21	24	22	25
Av. birth date	2/28/58	3/1/58	3/5/58	3/4/58
Av. birth wt. (lbs):				
Bulls	65	64	69	63
Heifers	66	67	62	65
Were calves creep fed?	No	No	No	No
Av. weaning date:				
Bulls				
Steers	9/29/58	9/29/58	9/29/58	9/29/58
Heifers	9/29/58	9/29/58	9/29/58	9/29/58
Av. weaning wt.:				
Bulls				
Steers	392	430	413	402
Heifers	350	369	359	368
Av. daily gain - birth to weaning				
Steers	1.54	1.71	1.66	1.5[illegible]
Heifers	1.35	1.45	1.44	1.49
Av. weaning type score:				
Bulls				
Steers	10.5	11.5	10.5	10.2
Heifers	9.8	9.6	10.1	10.0

I. Project title:

A study of Dwarfism in Beef Cattle. S92 186 (8-10) Coop. ARS

II. Objectives:

(1) To determine the pathogenesis of dwarfism in beef cattle by finding:
  (a) The morphological site of gene expression.
  (b) The period during which gene expression operates.
  (c) The mode of action of the responsible gene.

(2) Attempt to devise a method by which the dwarf carrier animal may be recognized at a young age.

III. Accomplishments During the Year:

The research committee (composed of members of the Animal Husbandry, Animal Pathology, and Biochemistry and Nutrition Departments) revised the project during the year. The major research effort is now being made on objectives 1a and 1b above.

Matings were made in the spring of 1958 to obtain fetuses of the following genotypes: NN, Nn, and nn when (N) is a normal gene and (n) is the gene for dwarfism. The plan was to obtain a minimum of four fetuses of each genotype at approximately monthly intervals from 60 to 150 days of prenatal development. Because some of the females failed to conceive we failed to obtain one fetus in each of the nn and NN genotypes. Additional matings have been made to complete the initial series.

All fetuses were obtained by Caesarian section. Blood samples were obtained from the dams just prior to the operations and from all fetuses, from which blood could be obtained, immediately on delivery. The fetuses were fixed in a formal-saline by perfusion. They are now being sectioned for histological examination. The blood samples were prepared and frozen for later analysis to determine P.B.I., glucose, manganese, serum phosphatase and perhaps other constituents.

IV. Future plans:

All fetuses will be sectioned and examined histologically as rapidly as possible. These findings will determine the future direction of the study.

V. Publications During the Year: None.

VI. Publications Planned:

(1) Article on growth hormone studies in dwarf and normal beef calves.
(2) Perhaps an article on the relation of measurement data to dwarfism.

I. Project Title:

Performance Testing of Beef Cattle on Virginia Farms. S.031-A.H. 542

II. Objectives:

(1) To develop a state-wide on-the-farm testing program for beef cattle in Virginia in which the major emphasis shall be placed on selection criteria for such economically important traits as regular reproduction, heavy weaning weights, milking and mothering ability, ability to gain rapidly after weaning, desirable type and conformation, and longevity.

(2) To investigate means of handling the field work through local personnel so that a large percentage of the breeding herds in Virginia could be included without requiring extensive travel and field work by personnel directing the program and handling the analyses of data.

(3) To identify some of the non-genetic factors such as sex of calf, age of dam and nutritional level in order to develop methods of more precisely estimating true genetic differences among individuals and groups.

(4) To obtain data from purebred and commercial herds handled under farm conditions in order to develop practical means of improving beef cattle through breeding methods.

(5) To determine the effectiveness of selection in the improvement of beef cattle under farm conditions.

III. Accomplishments During the Year:

Preweaning Performance:

During 1958, weaning weights and grades were obtained and index values computed for 5,097 calves in 74 Angus, 52 Hereford and 4 Shorthorn herds located in 45 counties in Virginia. These calves were sired by 408 purebred bulls. Their performance by breed and feeding practice is shown in table 1 below.

Table 1. Performance of 1958 Virginia Calves by Breed and Feeding Practice

	Angus Calves		Hereford Calves		Shorthorn Calves		Total or Average	
	No Creep	Creep	No Creep	Creep	No Creep	Creep	No Creep	Creep
No. Breeders	64	19	40	10	4	-	108	29
No. Sires	195	65	100	39	10	-	305	104
No. Calves	2556	582	1461	447	51	-	4068	1029
Average								
Age	209	197	214	216	211	-	211	205
Weight	400	403	414	426	403	-	405	417
Adj. D.G.	1.80	1.87	1.77	1.83	1.77	-	1.79	1.85
Type Score	11.5	12.4	11.3	11.8	12.1	-	11.4	12.1
Index	112	119	110	115	113	-	111	117

All calves were weighed and scored for type between 120 and 300 days. If more than half of the calves by any sire were creep-fed all of his calves were included in the creep-fed group; if less than half, all calves were included in the non-creep fed group. Calves must have been on creep a minimum of six weeks to be included in the creep-fed group.

Performance on R.O.P. Tests:

Performance records were obtained on 80 bulls, 359 replacement heifers and 126 steers of yearling age from the 1957 calf crop. The length of the test period for these cattle varied considerably but averaged about 168 days. The heifers and some of the steers were tested on pasture. The bulls and part of the steers were on full feed. A consolidated summary by breed and sex is shown in table 2.

Table 2. Summary of Cattle on ROP Test in Breeder's Herds by Breed and Sex

Breed	Sex	No. of Animals	Av. Final Weight	Average Gain	Days on Test	Average Daily Gain	Type Score	Index Value
Angus	bull	30	840	329	179	1.84	13.4	123
	heifer	293	322	165	166	.99	12.1	82
	steer	104	668	191	162	1.18	11.6	87
Hereford	bull	50	901	354	189	1.87	12.9	121
	heifer	38	691	222	166	1.34	12.0	96
	steer	15	836	392	178	2.20	14.0	140
Shorthorn	heifer	28	683	190	170	1.12	12.2	88
	steer	7	844	296	169	1.75	11.3	109

In the fall of 1958, 75 of the high indexed bull calves were started on a 140 day gain test at Culpeper, Virginia. They represented 38 herds of all three breeds. They all graded Choice (12-14) but varied in weaning index value from 115 to 167, with an average of 131. Average daily gains on test ranged from 1.89 to 3.54 with an average of 2.56. Their lifetime gain ranged from 1.67 to 2.53 and averaged 1.92. Table 3 shows a comparison of the performance of the bulls on the Culpeper test with those tested in breeder's herds.

Table 3. Comparison of all 1958 BCIA Tested Cattle with Bulls on Culpeper "ROP" Test

	All 1958 Cattle Indexed				Bulls on Culpeper Test			
Test Period	No. Head	ADG	Type	Index	No. Head	ADG	Type	Index
Preweaning	5097	1.80	11.5	112	67	2.10	12.8	130
TOP Test	80*	1.86	13.0	121	67	2.56	12.7	148
Lifetime	181*	1.92	12.9	121	67	2.13	12.7	131

*Yearling bulls only

Sixty-four ROP bulls were sold at public auction on April 2 for $40,200, or an average of $636 per head. Fifty-three of the bulls met the requirements for registration in Performance Registry International and 25 met the requirements for double registry.

Continuous Growth Records:

An additional 858 yearling cattle, mostly replacement heifers, from the 1957 calf crop were re-indexed as yearlings on a continuous growth basis. A consolidated summary of performance by breed and sex is shown in table 4.

Table 4. Summary of Continuous Growth Records by Breed and Sex

Breed		No. of Animals	Age In Days	Average Weight	ADG	Type Score	Index Value
Angus	bull	95	401	776	1.89	12.9	118
	heifer	399	428	592	1.43	12.1	101
	steer	89	344	564	1.62	11.1	102
Hereford	bull	85	465	956	1.95	13.0	125
	heifer	103	431	719	1.51	11.9	102
	steer	68	407	606	1.68	11.8	126
Shorthorn	bull	1	308	664	1.89	13.0	123
	heifer	13	403	633	1.62	12.5	109
	steer	5	395	764	1.87	11.4	114

Other Accomplishments:

It was reported previously that performance records on 4,166 non-creep fed calves were used to study the influence of age, sex, and season of birth of calf and age of dam on preweaning growth rate and type score of beef calves. A similar study of the records of 2,007 creep-fed calves has been completed. These findings have been published in the August, 1958 issue of the Journal of Animal Science and also in Va. Agr. Exp. Sta. Bul. 489.

Most of the objectives of this project have been accomplished. A state-wide on-the-farm testing program has been established and transferred to the Extension Service for supervision.

IV. Future plans:

This project has been closed out and a new one written which will enable the research staff to use the performance records collected through the BCIA program to obtain estimates of genetic parameters from field data, and conduct other studies of a research nature that will contribute to theoretical and practical knowledge about cattle.

V. Publications During the Year:

Marlowe, T. J. and J. A. Gaines. 1958. The influence of age, sex, and season of birth of calf and age of dam on preweaning growth rate and type score of beef calves. J. Animal Sci. 17:706-713.

Marlowe, T. J., C. M. Kincaid and G. W. Litton. 1958. Virginia Beef Cattle Performance Testing Program. Va. Agr. Exp. Sta. Bul. 489, 47 pages, illustrated.

Marlowe, T. J. 1958. Virginia BCIA provides additional service to breeders. Va. Angus Topics. June, 1958.

VI. Publications Planned: None

A SELECTION INDEX FOR BEEF CALVES AT WEANING

Va

-by-
R. P. Lehmann, J. A. Gaines, R. C. Carter and K. P. Bovard

Four selection indexes for beef calves were computed using data from 606 Angus, 556 Hereford, and 689 Shorthorn calves, all purebred, and 36 grade Hereford cattle. The data were collected during the nine year period 1950 through 1958 at the Beef Cattle Research Station, Front Royal, Virginia.

Adjustments were made for five fixed effects (breed, sex, year, month of birth, and age of dam) using the least squares method employing matrix arithmetic. The effects mentioned influenced daily gain more than they influenced type score.

Heritabilities were computed by the paternal half-sib method. They were estimated to be .20±.03 for daily gain and .33+.04 for type score.

A phenotypic correlation of .41 and a genetic correlation of .007 were estimated between daily gain and type score. The large difference in the two correlations, and the fact that the genetic correlation was essentially zero, suggested that the two traits were genetically independent but positively associated in the eyes of the graders.

The economic value of average daily gain was calculated using prices paid at Virginia feeder calf sales over a sixteen year period (1943-1958). The value of type score was based on prices paid at the same sales over an eight year period (1951-1958). The values used were $54.50 per pound increase in average daily gain and $9.00 per increase in type score.

The four indexes are shown in Table 1. The first (I_1) was the best estimate of an individual's breeding value. The second (I_2) was based on daily gain, and the third (I_3) was based on type score. The fourth (I_4) gave equal emphasis to g growth rate and type; it was constructed in order to evaluate the efficiency of an index equivalent to the one being used in performance testing programs in a number of states when compared to the first three indexes described.

Comparisons among the indexes were made on the basis of their correlations with the aggregate genetic values and the expected genetic changes per standard deviation change in index. Clearly, index one giving major emphasis to daily gain, was shown to be preferable to the other indexes. There appeared to be very little difference in the economic return expected from the last three indexes.

Table 1

Relative emphasis (b) values, correlations and expected genetic changes for the four selection indexes studied.

	b ÷ values for index		R_{IH}	Expected Genetic Change	
	B1	B2		G_1	G_2
I_1	10.791	0.344	0.414	0.043	0.091
I_2	1.0	0.0	0.235	0.047	0.003
I_3	0.0	1.0	0.236	0.0004	0.490
I_4	6.25	1.0	0.246	0.028	0.292

Supplement: Northern Virginia Pasture Research Station

The Northern Virginia Pasture Research Station maintains a purebred Angus herd of approximately 60 cows and 3 herd sires. The cows are bred to calve during the summer in order that they may be weaned in March and the entire calf crop used for grazing tests on the Station. All male calves remain as bulls until weaned when they are all castrated except for two or three top calves that show promise of becoming herd sires.

From the 58 cows bred during the fall of 1956, 55 calves were raised to weaning. The average birth date was July 24, 1957 and all calves were weaned on March 15, 1958. The performance records by sire progeny groups are shown in table 1.

Table 1. Preweaning Performance of 1957 Calves by Sire Progeny Groups

Sire No.	No. Offspring	Age in Days	Weight	ADG	Adj.* Daily Gain	Type** Score	Index Value
Unknown	5	201	393	1.63	1.82	12.0	115
364	16	229	473	1.78	1.98	11.5	119
R71	18	226	438	1.66	1.86	12.5	119
WA22	16	230	461	1.74	1.96	12.4	123

* Gain adjusted for sex of calf, season of birth, and age of dam.
**Type score code: Fancy 15-17; Choice 12-14; Good 9-11; etc.

Shortly after weaning these calves were put on the grazing plots. An ROP pasture test was obtained over a 165 day period from April 22, 1958 to October 1, 1958. The postweaning performance on pasture is shown in table 2.

Table 2. Postweaning Performance on Pasture by Sire and Sex

Sire No.	Sex*	Number of Animals	Days on test	Final Weight	Total Gain	ADG	Type Score	Index Value
364	2	9	159	664	152	0.96	10.7	74
	3	6	172	669	179	1.04	9.7	72
R71	2	9	164	579	123	0.75	11.8	71
	3	9	167	609	154	0.92	11.8	78
WA22	2	11	164	577	127	0.77	11.4	70
	3	5	173	688	145	0.84	11.2	72

*2 = heifers; 3 = steers.

The heifers gained an average of 134 pounds, or 0.82 pounds per day, and the steers gained 159 pounds, or 0.94 pounds per day, during the pasture period.

Additional production and slaughter data on these and other cattle on the Station are shown in table 3.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1958
Northern Virginia Pasture Research Station

Line or group designation				
Location	Middleburg, Virginia			
Breeding:	Angus[a]	Angus[b]	Hereford[a]	Hereford[b]
Sex:	Steer	Steer	Steer	Steer
No.	8	8	8	8
Av. age (fall 1957)	15	15	22	22
Av. wt. (fall 1957)	734	671	891	811
Days on pasture	188	188	188	188
Av. gain on pasture	1.09	.82	1.69	1.16
Days on feed	89	89	89	89
Av. gain on feed	1.87	1.84	1.71	2.03
Animals slaughtered: Averages at slaughter				
Age	18	18	24	24
Weight	900	835	1043	992
Live grade	9.9	9.2	10.6	9.7
Dressing percent	58.59	57.50	59.49	57.36
Carcass grade	10.4	8.2	10.1	9.5
Daily feed lot ration:				
Alf-orch hay	7.8	10.4	7.8	10.4
Ground, shelled corn	13.5	12.5	13.5	12.5
Cottonseed meal	1.6	1.6	1.6	1.6

[a] Grain on pasture starting June 12 - fed ground shelled corn at 1% of body weight.

[b] Received no grain on pasture.

BEEF CATTLE RESEARCH STATION

FRONT ROYAL, VIRGINIA

-by-
K. P. Bovard and B. M. Priode

I. Project Title:

The Improvement of Beef Cattle for Virginia Through Breeding Methods
AH 150.16 (S-10) Coop. ARS

II. Objectives:
Beef cattle research projects are conducted with three breeds of cattle (Angus, Hereford, and Shorthorn) and are associated with problems relating to the improvement of beef cattle for Virginia through breeding methods.

The objectives of the investigation are as follows:

(1) To estimate the progress to be expected from mass selection as compared with family selection in the improvement of beef cattle.

(2) To evaluate selection criteria and procedures and develop more precise and effective measures of quality and performance in beef cattle.

(3) To simplify methods of progeny or sib testing whereby breeding cattle can be evaluated at comparatively young ages.

The long term breeding program for the work at Front Royal may be roughly sub-divided into five phases, each of which has some direct bearing on the main objectives stated above:

(1) Test from weaning to yearling age those bull calves which appear to be herd-sire prospects on the basis of their pre-weaning performance.

(2) Progeny test as yearlings those bulls with favorable records from Phase 1.

(3) Choose as foundation sires those bulls with good records from Phases 1 and 2. Obtain 32 daughters by each foundation sire and out of unrelated cows.

(4) Allot 32 daughters from each foundation sire as follows: 16 are placed back with their sire to form an inbred line; 8 become part of a growth herd where selection emphasis is on growth; and 8 become part of a type herd where selection emphasis is on type. For each breeding plan, measure the progress in terms of changes in growth rate and conformation. Compare the actual results with those expected from theoretical considerations.

(5) Test inbred lines form combining ability and outcross performance.

III. Accomplishments During 1958:

(1) Facilities. The Beef Cattle Research Station comprises 4,136 acres. Topography would be classed as steep and rough; soil type, as classified by soil men, "green-stone"; soil origin from a granite sandstone.

Approximately two thirds, or 2,758 acres, is good to excellent grazing land. It is a good pasture soil and very productive under proper fertilization and management. In recent years, carrying capacity has been increased from one animal to approximately four acres to one animal to three acres. The remaining one-third, or 1,378 acres, is wooded and furnishes lumber and posts.

Station land suitable for cultivation is limited, and to supplement this, a 130 acre river bottom farm is rented. Station employees farm this land, using the most modern equipment. Our plan is to grow all necessary feed, except protein supplement, for the research herds and the cattle on Record of Performance tests, based on the rate of at least one ton of hay and one ton of silage per animal per year. in 1958, crops produced on station land and leased land amounted to 140 tons alfalfa, 196 tons orchard grass, 920 tons silage, and 1,138 bushels ear corn.

The buildings and certain equipment were transferred from the Army Remount Service to the U.S. Department of Agriculture in 1948. There are around 150 structures of varying degrees of usefulness.

During 1958, the station acquired four $\frac{1}{4}$ ton Jeeps and one 5 ton dump truck from surplus at Fort Belvoir, Virginia, to replace older models in use.

A 2,000 gallon trailer type gasoline tank for the hauling and storage of feed molasses was secured from surplus at the Norfolk Naval Station.

A set of 6,000 pound capacity Howe cattle scales were purchased for installation in the Slate Hill area.

(2) Cattle. As of January 1, 1958, there was a total of 796 purebred cattle at this station:

297	purebred Angus
201	purebred Hereford
298	purebred Shorthorn
796	total

Of this number, 466 were adult cows assigned to breeding herds in April, 1958.

The cattle inventory changed considerably throughout the year. Total cattle numbers were 179 head less on December 31, 1958 than at the beginning of the year. At an auction sale in April, 1958 to reduce

total numbers and bring the cattle inventory in line with the carrying capacity of the station, 110 purebred cows, 47 calves, and 4 older bulls were sold. 51 cows were sold in December, 1958 as part of the regular culling procedure.

The expected annual inventory, when all herds and lines are established, is shown below. The total number of cows in both selection herds in the Angus and Shorthorn breeds will approximate the total number in the respective inbred herds of these breeds. With 3 selection herds in the Hereford breed there will be about 32 more cows in the selection herds than in the inbred lines.

The expected annual inventory as of December 1 of each year will be as follows:

	Breed			
	Angus	Hereford	Shorthorn	Total
Females				
Bred cows and heifers	128	160	128	416
Open yearlings	18	22	18	58
Calves	50	65	50	165
Males				
Mature bulls	6	7	6	19
Yearling bulls	2	3	2	7
Bull calves	20	24	20	64
Steer calves	24	30	24	78
Total	248	311	248	807

One new Hereford bull, NCP McHenry 6497, was obtained in February 1958, and will be the foundation sire for a group of Hereford cattle. This bull is believed to be dwarf free, had an outstanding growth record, and has quite acceptable conformation.

An Angus bull, Tattoo 167, C. Gracious Bardomere, 2511413, was received from Clemson College, Clemson, South Carolina, and was used in one of the 1958 test herds.

Five young Shorthorn bulls were purchased in Canada in October. They were placed with bulls from the Front Royal breeding groups on Record of Performance Tests as potential herd sires for use in the growth or type selection herds.

(3) Public Relations: The handling of official visitors to the station is an important phase of the program. The public took active participation in the Field Day and Bull Sale held on April 2, 1958, and in the Herd Reduction Sale on April 23

A planned tour of station facilities was conducted on August 9 for approximately 500 Hereford breeders. Arrangements were made through the State Hereford Breeders' Association Representative as a regular

stop on their annual summer tour.

A two day Cattlemen's Short Course held on August 12 and 13 was attended by about 100 nearby producers. Discussions on feeding, breeding, and management were led by staff members from Virginia Polytechnic Institute and the Agricultural Research Center, Beltsville, Maryland, as well as by local personnel.

Approximately ten to twelve visitors were received each month, but these arrived as individuals or in small groups. In addition, there were several visitors from foreign countries, usually spending a day away from their primary contacts in Washington, D.C. An average of one-half day was spent in consultation or demonstration with each such group of visitors.

RESEARCH RESULTS

Record of Performance Testing. During the '57 - '58 feeding period, 40 bulls, 58 steers, and 123 heifers were on R.O.P. The bulls were individually fed; heifers and steers were fed in groups. Average daily gains on test and conformation scores were obtained for each animal. Summaries of these data were as follows:

Record of Performance Test Completed in the Spring of 1958

Breed	No.	Ending weight 3-19-58	ADG on test	Type rating
Bulls:				
Angus	17	915	2.26	11.5
Hereford	9	866	2.20	10.2
Shorthorn	14	896	2.56	11.2
Heifers:				
Angus	49	654	1.33	11.5
Hereford	27	605	1.34	10.9
Shorthorn	47	602	1.27	11.0

Record of Performance Test Completed for Steers
11-13-57 to 5-28-58 (196 days)

Item	No.	Weight Beg.	Weight End	Av. daily gain	Grade Live	Grade Carc.	Dressing %	Loin eye area
Ration Comparisons:								
Ground and mixed	22	500	828	1.71	11.0	10.1	58.0	9.5
Pelleted	18	483	803	1.65	10.8	9.9	57.2	9.8
Long hay and grain	18	500	798	1.52	9.9	9.4	57.8	10.2
Breed Comparisons:								
Angus	19	522	788	1.36	10.1	9.3	56.8	10.1
Hereford	16	488	822	1.71	10.5	9.8	58.1	10.2
Shorthorn	23	478	823	1.81	11.1	10.3	58.2	9.2
Overall Av.	58	495	811	1.63	10.6	9.8	57.7	9.8

b. Reproductive Performance. Dr. J. N. Wiltbank, Animal Physiologist, continued his cooperative work (Beltsville and Front Royal) on "Reproductive Performance in Beef Cattle". The 466 cows in breeding herds were palpated at monthly intervals to determine onset of ovarian activity. Results of this work will be published by Dr. Wiltbank.

c. Grub Control. Optimum timing of systemic insecticides for control of cattle grubs was studied by Dr. E.C. Turner, Entomology Section, VPI. Starting in July, a separate sample of 14 heifer calves was sprayed each month. These animals will be examined at monthly intervals during the coming Spring for a measure of grub infestation.

d. Feeding Apple Pomace. A feeding trial with dried apple pomace will be started early in 1959. The objective will be to determine the amount and duration of DDT residues in animal tissues. This is an outgrowth of previous work at this station with feeding apple pomace.

IV. Future Plans.

a. Cow Weights. A study of changes with season, year, and age as these affect mature cow weight, is being considered. Data covering about 500 cows per year is available since 1951. Breed, and line within breed, comparisons will also be of interest in the final analysis.

b. Station Bulletin. A semi-popular bulletin describing the general breeding plan and results of the work to date is being considered.

c. A.I. Breeding. Since it was a recommendation of the State's Veterinarians at Virginia Polytechnic Institute that precautionary measures against the spread of Vibrio be instituted, all cows assigned to breeding herds during 1959 and 1960 breeding seasons will be bred artificially. This will require some major changes in previous management practices during the breeding season, as well as the purchase and construction of new facilities.

V. Publications

"Effect of calving date on subsequent calving performance" by M. J. Burris and B. M. Priode, published in Journal of Animal Science, Vol. 17, pages 527-533.

"Systemic insecticides for control of cattle grubs in Virginia" by E. C. Turner and J. A. Gaines, published in the Journal of Economic Entomology, Vol. 51, pages 582-585.

In addition to the publications cited above, the following publications deal with work done in part or in entirety at the Beef Cattle Research Station, Front Royal, Va.

"Estimates of genetic and phenotypic parameters in beef cattle. I. Heritability of growth rate estimated from response to sire selection" by C. M. Kincaid and R. C. Carter, published in Journal of Animal Science 17-675-683; 1958.

"Repeatability of performance in the beef cow" by J. C. Taylor. Unpublished M.S. thesis, VPI Library, 1958.

"Heritability of feed efficiency in beef cattle that are full fed" by J. A. Gaines, R. C. Carter, and C. M. Kincaid, published in Journal of Animal Science 17:1143 (Abstract); 1958.

At present, no other research results are in press for journal publication. However, three graduate students now at VPI will be working with Front Royal beef cattle data for thesis material. They are D.C. Meyerhoeffer, R. P. Lehman, and John Thornton. Two of these men have previously been on the staff at Front Royal.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Line or group designation	57	145	420	870	890	1081	1093	Purchased	59	1133
Location				Front Royal,		Virginia				
Breeding of calves	Angus	Angus	Angus	Angus	Angus	Angus	Angus	Angus	Angus	Angus
Bulls, No.	1	1	3	1	3	2	3	2		
Av. weaning wt. (lbs)	454	473	569	517	582	532*	557			
Av. initial age (days)	256	186	235	221	239	235	243			
Av. initial wt. (lbs)	449	468	579	522	602	512	550	549		
Length of feeding period (days)	168	168	168	168	168	168	168	168		
Av. daily gain (lbs)	2.70	1.84	2.43	2.54	2.16	2.42	2.31	2.01		
Av. score (type/condition)	10.9	10.4	11.2	11.6	11.4	13.4	11.5	11.4		
Feed per cwt. gain (lbs)										
Concentrates)	759	904	809	691	832	368	784	864		
Roughage)										
Steers, No.	3		3		4	3	5			
Av. weaning wt. (lbs)	388		562*		486	455*	488*			
Av. initial age (days)	284		289		286	271	281			
Av. initial wt. (lbs)	450		573		554	476	552			
Length of feeding period (days)	196		196		196	196	196			
Av. daily gain (lbs)	1.21		1.33		1.38	1.16	1.37			
Av. score (type/condition	9.6		10.7		9.0	9.3	10.0			
Heifers, No.	6	8	8	2	11	6	5		1	2
Av. weaning wt. (lbs)	403	386*	436	430*	476	400	435		295	459
Av. initial age (days)	280	275	276	252	274	273	288		267	292
Av. initial wt. (lbs)	485	446	465	465	519	508	505		365	533
Length of feeding period (days)	126	126	126	126	126	126	126		126	126
Av. daily gain (lbs)	1.23	1.19	1.69	1.13	1.43	1.12	1.39		1.44	0.91
Av. score (type/condition)	11.1	11.2	11.5	12.0	11.3	12.5	11.8		8.6	11.1

* Average not based on entire group.

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Line or group designation	26	322	373	153	1118	1119
Location			Front Royal, Virginia			
Breeding of calves	Hereford	Hereford	Hereford	Hereford	Shorthorn	Shorthorn
Bulls, No.	3	3	3		1	2
Av. weaning wt. (lbs)	460	528	401		453	453
Av. initial age (days)	231	236	211		234	222
Av. initial wt. (lbs)	477	554	455		453	468
Length of feeding period (days)	168	168	168		168	168
Av. daily gain (lbs)	1.94	2.21	2.47		2.01	2.78
Av. score (type/condition)	9.16	10.8	10.7		8.8	13.0
Feed per cwt. gain (lbs)						
Concentrates						
Roughage	760	805	668		765	742
Steers, No.	3	6	4	3		5
Av. weaning wt. (lbs)	396	387	429	401		432
Av. initial age (days)	277	274	272	235		284
Av. initial wt. (lbs)	490	467	518	486		479
Length of feeding period (days)	196	196	196	196		196
Av. daily gain (lbs)	1.67	1.58	1.94	1.68		1.66
Av. score (type/condition)	10.9	11.0	10.5	10.2		11.8
Heifers, No.	6	10	4	7	2	7
Av. weaning wt. (lbs)	378	396	384	380	454	403
Av. initial age (days)	260	276	277	251	280	264
Av. initial wt. (lbs)	438	447	437	423	431	473
Length of feeding period (days)	126	126	126	126	126	126
Av. daily gain (lbs)	1.19	1.28	1.67	1.36	1.28	1.44
Av. score (type/condition)	10.1	11.2	10.9	11.5	11.2	12.3

POSTWEANING PERFORMANCE OF 1957 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Line or group designation	1174	1176	86	114	287	885
Location			Front Royal, Virginia			
Breeding of calves	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn
Bulls, No.	2	2	1	2	3	1
Av. weaning wt. (lbs)	447	436	498	471	442	479
Av. initial age (days)	179	229	229	238	226	255
Av. initial wt. (lbs)	465	441	511	485	456	490
Length of feeding period (days)	168	168	168	168	168	168
Av. daily gain (lbs)	2.94	2.72	2.44	2.54	2.57	1.67
Av. score (type/condition)	11.1	11.9	13.1	11.5	10.7	7.9
Feed per cwt. gain (lbs)						
Concentrates Roughage	794	793	761	774	782	860
Steers, No.	4	3		3	3	5
Av. weaning wt. (lbs)	471	401		393	369	427
Av. initial age (days)	280	257		266	306	284
Av. initial wt. (lbs)	530	422		465	440	510
Length of feeding period (days)	196	196		196	196	196
Av. daily gain (lbs)	1.72	1.66		1.79	1.59	2.03
Av. score (type/condition)	11.3	10.7		11.0	10.7	11.0
Heifers, No.	6	6	2	6	14	4
Av. weaning wt. (lbs)	396	368	335	389	371	362
Av. initial age (days)	263	269	271	264	276	268
Av. initial wt. (lbs)	455	429	366	434	452	412
Length of feeding period (days)	126	126	126	126	126	126
Av. daily gain (lbs)	1.28	1.25	1.27	1.61	1.53	1.54
Av. score (type/condition)	10.0	10.9	10.3	10.1	11.8	8.7

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	59	57	420	890	1165	1209	150
Location	Front Royal, Virginia						
Breed of sire	Angus	Angus	Angus	Angus	Angus	Angus	Angus
Breed of dam	Angus	Angus	Angus	Angus	Angus	Angus	Angus
No. cows bred	16	17	24	24	18	18	30
No. cows calving	11	13	10	11	18	11	30
No. calves raised	9	12	5	6	15	10	12
Av. birth date	2/25/58	2/8/58	2/10/58	2/28/58	2/15/58	3/10/58	2/11/58
Av. birth wt. (lbs)							
Bulls	58	58	58	62	61	69	67
Heifers	62	55	61	63	57	63	63
Were calves creep fed?	No	No	No	No	No	No	No
Av. weaning date:	9/1/58	9/1/58	9/1/58	9/1/58	9/1/58	9/1/58	9/1/58
Bulls							
Steers							
Heifers							
Av. weaning wt.: Adj. 180 day							
Bulls	414	350	359	343	407	447	413
Steers	"	"	"	"	"	"	"
Heifers	390	352		425	392	405	398
Adjusted av. daily gain - birth to weaning*	1.91	1.64	1.67	1.79	1.90	1.98	1.89
Av. weaning type score:							
Bulls	12.1	10.2	9.5	8.9	12.0	11.7	11.5
Steers	"	"	"	"	"	"	"
Heifers	11.5	11.1		10.1	12.7	11.3	12.8

Va

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	115	322	373	26	82	885	1176
Location				Front Royal, Virginia			
Breed of sire	Angus	Hereford	Hereford	Hereford	Hereford	Shorthorn	Shorthorn
Breed of dam	Angus	Hereford	Hereford	Hereford	Hereford	Shorthorn	Shorthorn
No. cows bred	30	28	32	36	19	18	16
No. cows calving	24	19	28	22	1	14	9
No. calves raised	8	15	21	19	1	8	7
Av. birth date	2/9/58	2/19/58	2/19/58	2/20/58	2/24/58	2/7/58	3/3/58
Av. birth wt. (lbs):							
Bulls	66	66	69	62	72	69	75
Heifers	58	66	68	60		68	69
Were calves creep fed?	No	No	No	No	No	No	No
Av. weaning date:							
Bulls	9/1/58	9/1/58	9/1/58	9/1/58	9/1/58	9/1/58	9/1/58
Steers							
Av. weaning wt: Adj. 180 days							
Bulls	388	372	386	368	396	344	404
Steers	"	"	"	"	"	"	"
Heifers	400	331	367	353		334	364
Adjusted av. daily gain - birth to weaning	1.85	1.64	1.71	1.66	1.80	1.50	1.75
Av. weaning type score:							
Bulls	11.3	10.8	10.6	10.5	11.1	8.7	11.6
Steers	12.2	10.4	10.3	11.4		9.7	11.4

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	988	287	114	1255	29	1009
Location			Front Royal, Virginia			
Breed of sire	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn
Breed of dam	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn
No. cows bred	16	20	20	22	24	39
No. cows calving	3	8	16	11	18	31
No. calves raised		6	11	8	12	18
Av. birth date	3/3/58	3/6/58	2/19/58	2/8/58	2/25/58	2/16/58
Av. birth wt. (lbs):						
Bulls		73	67	68	70	72
Heifers	67	63	64	63	70	70
Were calves creep fed?	No	No	No	No	No	No
Av. weaning date:						
Bulls	9/1/58	9/1/58	9/1/58	9/1/58	9/1/58	9/1/58
Steers	9/1/58	9/1/58	9/1/58	9/1/58	9/1/58	9/1/58
Av. weaning wt.:						
Bulls		350	353	349	362	374
Steers		"	"	"	"	"
Heifers		394	345	302	353	356
Adjusted av. daily gain - birth to weaning		1.79	1.57	1.45	1.59	1.64
Av. weaning type score:						
Bulls		10.1	10.7	10.6	10.0	10.1
Steers		"	"	"	"	"
Heifers		11.8	11.0	9.9	9.9	10.9

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	328	12	420	890	82	885
Location			Front Royal, Virginia			
Breed of sire	Hereford	Hereford	Angus	Angus	Hereford	Shorthorn
Breed of dam	Hereford	Hereford	Shorthorn	Hereford	Shorthorn	Hereford
No. cows bred	10	22	1	5	2	2
No. cows calving		2	1	4	2	2
No. calves raised		1	1	4	2	2
Av. birth date		4/10/58	3/12/58	2/14/58	1/29/58	3/19/58
Av. birth wt. (lbs):						
Bulls		44	67	67	72	68
Heifers		65		68	81	64
Were calves creep fed?		No	No	No	No	No
Av. weaning date:						
Bulls		9/1/58	9/1/58	9/1/58	9/1/58	9/1/58
Steers		"	"	"	"	"
Av. weaning wt.:						
Bulls			315	434	421	473
Steers			"	"	"	"
Heifers		411		379	346	399
Adjusted av. daily gain - birth to weaning		2.08	1.38	1.81	1.71	2.06
Av. weaning type score:						
Bulls			9.0	12.0	10.4	11.0
Steers			"	"	"	"
Heifers		13.1		11.3	10.3	9.7

Va

-by-
H. E. Kidder

I. Project Title:

Reproductive Efficiency of Beef Cattle. Anim. Husb. 90 (S-10)

II. Objectives:

(1) To determine the practicability and effects of breeding beef cows at first heat following parturition.
(2) To determine the incidence of ovulatory anomalies in beef cattle and their effects on reproductive performance.
(3) To compare the reproductive efficiency of two breeds of beef cattle when managed under like conditions.

III. Research accomplishments:

The West Virginia University purebred Angus and Hereford herds of approximately 50 breeding females have been on this experiment for the past four years.

Data have been analyzed on the service periods (from one calving to the next) of 57 Hereford cows with 77 service periods and 43 Angus cows with 78 service periods. Two service periods have been studied for 10 Hereford cows and 17 Angus cows and three service periods have been studied for 15 Herefords and 9 Angus cows. The 77 service periods of the Herefords have averaged 70.6 days with a standard deviation (S.D.) of 39.6 days. In the case of 78 Angus service periods the average was 70.1 days with an S.D. of 33.7 days. No significant difference was noted between breeds.

The service periods were divided into four intervals for statistical study:

1. Period of ovarian inactivity from parturition to the first corpus luteum.
2. A period from first corpus luteum to first heat.
3. The time from calving to first heat or a combination of intervals 1 and 2.
4. A period of infertility represented by the time between breeding and conception.

Combined data for both breeds gave an average length of interval 1 of 35.3 days, interval 2 of 14.3 days, interval 3 was 49.6 days and interval 4 was 20.7 days. The S.D.'s were 15.3, 23.5, 28.5 and 32.4, respectively.

During the coming year a summary of the first 4 years' work will be undertaken. A summary of the first 2 years is being prepared in manuscript form at the present time.

W Va

In a second project being conducted by West Virginia Station 100 grade Hereford cows at the Wardensville Sub-Station have been placed on an experiment: (The Effects of Two Systems of Selection of Breeding Stock on Beef Cattle Performance). The objective of this project is to apply a selection index procedure to a commercial beef cattle enterprise and evaluate its effectiveness in terms of both theoretical expected gain and actual gain as compared to a non-selected population. This project is just getting underway.

PERFORMANCE OF COW HERDS. 1958 CALVES

Line or group designation	Hereford Herd	Angus Herd
Location	--West Virginia University--	
Breed of sire	Hereford	Angus
Breed of dam	Hereford	Angus
No. cows bred	58	38
No. cows calving	52	38
No. calves raised	50	32
Av. birth wt. (lbs):	65.67	57.95
Bulls	64.23	59.95
Heifers	66.75	55.95
Were calves creep fed?	Yes	Yes
Av. weaning date:		
Bulls	205 days	205 days
Steers	205 days	205 days
Heifers	205 days	205 days
Av. weaning wt.:		
Bulls	352.2	402.5
Steers	352.2	402.5
Heifers	355.4	351.5
Non-adjusted av. daily gain - birth to weaning	1.41	1.57
Av. weaning type score:*		
Bulls	12.05	12.67
Steers	12.05	12.67
Heifers	13.31	12.50

*Scored on a 17 point basis.

1959 S-10 TECHNICAL COMMITTEE MEETING
Georgia Coastal Plain Experiment Station, Tifton, Georgia
August 30 - September 2, 1959
Agenda

Sunday, August 30, 1959

Executive Committee meeting.

Monday, August 31, 1959

Tuesday, September 1, 1959

Station reports from Virginia, Texas, and Tennessee.
Leave for Reidsville, Georgia.
Tour of Beef Cattle and Dairy Cattle Breeding Projects.
State Prison Farm, Reidsville, Georgia
Return to Tifton

Wednesday, September 2, 1959

Station reports from Maryland, West Virginia, Kentucky, and South Carolina.
Recess.
Business meeting.
Adjourn.

MINUTES
Meeting of the Executive Committee
S-10, Southern Regional Beef Cattle Breeding Project

A meeting of the Executive Committee of the S-10 Regional Project was held as scheduled at the Alpine Motor Lodge, Tifton, Georgia, on August 30, 1959. W. W. Green Chairman, called the meeting to order at 7:30 P:M: Executive Committeemen present were: C. M. Kincaid, W. W. Green, Marvin Koger, and T. C. Cartwright. Others in attendance were: B. L. Southwell, E. J. Warwick, M. J. Burris, and R. A. Damon.

Minutes of the previous Executive Committee meeting (November 29, 1958, Sherman Hotel, Chicago, Illinois) were read and approved.

The advisability of the appointment of a committee on analysis of data was discussed. Dr. Kincaid stated that he felt it better to let individuals work out problems as they arose. The Committee as a whole concurred. With reference to efficiency data, any station with data suitable for inclusion in a regional publication should contact either Dr. Kincaid or Dr. Gaines.

An invitation from the NC-1 Regional Group to meet jointly with them in Oklahoma was discussed. The Committee drafted the following recommendation to the Technical Committee: It is recommended that the S-10 group participate in a joint meeting with NC-1 if the W-1 Region, which has also been invited, votes to attend and that if W-1 votes otherwise, to suggest a joint meeting of the three committees in 1961.

Dr. Kincaid presented the problem of S-10 officers assuming their positions January 1. After discussion, the Committee adopted the following recommendation to the Technical Committee: Commencing with the 1959 meeting, new officers shall assume all responsibilities of office immediately after adjournment of the meeting at which they are elected to office except for unfinished business. This includes the preparation of the annual report which shall be the responsibility of the outgoing Chairman and the recording the minutes of the meeting which shall be the responsibility of the outgoing secretary.

The suggestion presented by Dr. Kincaid that the meats specialists present at the meeting be appointed as an advisory committee to review recommendations for evaluation of beef from project steers was approved. J. W. Cole will serve as co-chairman.

Dr. Green asked for suggestions for a Resolutions Committee and agreed upon C. J. Brown (Chairman), C. S. Hobbs, and W. C. Godley.

The procedure of having each state report each year and encouraging more discussion was discussed. It was agreed to recommend to the Technical Committee that next year's Executive Committee be responsible for setting next year's program either as a separate S-10 meeting or in conjunction with NC-1 and W-1 if a joint meeting develops.

It was agreed that a ten-year report of progress or summary of results from the S-10 region appeared to be in order by next year and that such a report should be recommended to the Technical Committee. Further, it was recommended that Dr. Kincaid be in charge of preparing the summary and that he should be encouraged to request assistance from any Technical Committeeman as needed.

1959 S-10 TECHNICAL COMMITTEE MEETING

The 1959 meeting of the S-10 Technical Committee was held at the Georgia Coastal Plain Experiment Station, Tifton, Georgia, August 31, September 1 and 2, 1959. Dr. W. W. Green, Chairman, called the meeting to order at 8:15 August 31. The Technical Committeeman from each station was asked to introduce himself and all the others present from his state. The following representatives of the S-10 Technical Committee and their guests were present (Technical Committee members are designated by an asterisk):

*T. B. Patterson, Alabama Agr. Exp. Sta., Auburn, Alabama
*C. J. Brown, Arkansas Agr. Exp. Sta., Fayetteville, Arkansas
*Marvin Koger, Florida Agr. Exp. Sta., Gainesville, Florida
F. M. Peacock, Range Cattle Station, Ona, Florida
J. S. Hentges, Jr., A. H. and N. Dept., University of Florida, Gainesville, Florida
R. H. Alsmeyer, A. H. and N. Dept., University of Florida, Gainesville, Florida
A. C. Warnick, A. H. and N. Dept., University of Florida, Gainesville, Florida
*B. L. Southwell, Georgia Coastal Plain Exp. Sta., Tifton, Georgia
W. C. McCormick, Georgia Coastal Plain Exp. Sta., Tifton, Georgia
T. M. Clyburn, GeorgiaCoastal Plain Exp. Sta., Reidsville, Georgia
Frank P. King, Georgia Coastal Plain Exp. Sta., Tifton, Georgia
D. R. Brazul, Pitts, Georgia
D. M. Baird, Georgia Exp. Sta., Experiment, Georgia
E. P. Warren, A. H. Dept., University of Georgia, Athens, Georgia
R. O. Williams, Georgia Agr, Ext. Ser., Athens, Georgia
H. C. McCampbell, Georgia Exp. Sta., Experiment, Georgia
W. E. Neville, Jr., Georgia Exp. Sta., Experiment, Georgia
J. L. Carmon, University of Georgia, Athens, Georgia
O. E. Sell, Dept. of Animal Industry, Experiment, Georgia
D. W. Beardsley, Georgia Coastal Plain Exp. Sta., Tifton, Georgia
J. D. Johnson, Jr., Georgia Coastal Plain Exp. Sta., Tifton, Georgia
J. A. Christian, Georgia Agr. Ext. Ser., Athens, Georgia
Bob Long, Div. of An. Ind., University of Georgia, Athens, Georgia
D. M. Hale, Georgia Coastal Plain Exp. Sta., Tifton, Georgia
*N. W. Bradley, Kentucky Agr. Exp. Sta., Lexington, Kentucky
*R. S. Temple, Louisiana Agr. Exp. Sta., Baton Rouge, Louisiana
T. M. DeRouen, Louisiana Agr. Exp. Sta., Jeanerette, Louisiana
A. N. Mullins, Louisiana State University, Baton Rouge, Louisiana
S. H. Fowler, Louisiana State University, Baton Rouge, Louisiana
*W. W. Green, Maryland Agr. Exp. Sta., College Park, Maryland
*C. E. Lindley, Mississippi Agr. Exp. Sta., State College, Mississippi
W. T. Backus, Mississippi Agr. Exp. Sta., State College, Mississippi
*J. H. Gregory, North Carolina Agr. Exp. Sta., Raleigh, North Carolina
J. E. Legates, Animal Breeding Sec., N. C. State College, Raleigh, North Carolina
*W. C. Godley, South Carolina Agr. Exp. Sta., Clemson, South Carolina
D. H. Kropf, South Carolina Agr. Exp. Sta., Clemson, South Carolina
*C. S. Hobbs, Tennessee Agr. Exp. Sta., Knoxville, Tennessee
R. J. Cooper, University of Tennessee, Knoxville, Tennessee
J. W. Cole, University of Tennessee, Knoxville, Tennessee

L. E. Orme, University of Tennessee, Knoxville, Tennessee
*T. C. Cartwright, Texas Agr. Exp. Sta., College Station, Texas
G. T. King, Texas Agr. Exp. Sta., College Station, Texas
*J. A. Gaines, Virginia Agr. Exp. Sta., Blacksburg, Virginia
*H. E. Kidder, West Virginia Agr. Exp. Sta., Morgantown, West Virginia
Luis Rivera Brenes, Puerto Rico Agr. Exp. Sta., Rio Piedras, Puerto Rico
C. M. Kincaid, S-10 Regional Coordinator, AHRD, USDA, Knoxville, Tennessee
M. J. Burris, SESD, USDA, Washington, D. C.
E. J. Warwick, AHRD, USDA, Beltsville, Maryland
W. C. Burns, AHRD, USDA, West Central Florida Exp. Sta., Brooksville, Florida
B. M. Priode, AHRD, USDA, Beef Cattle Research Sta., Front Royal, Virginia
R. A. Damon, Jr., ARS, USDA, Beltsville, Maryland
Ralph Bogart, Oregon Agr. Exp. Sta., Corvallis, Oregon

After the introduction of visitors, Dr. Frank P. King welcomed the group to the station and gave a brief review of the history and functions of the Georgia Coastal Plain Experiment Station. The remainder of the meeting followed the scheduled program with only minor changes in the order of talks given. Copies of the minutes of the Executive Committee meeting, the Business Meeting of the S-10 Technical Committee and papers or material not included with station reports follow.

BUSINESS MEETING OF THE TECHNICAL COMMITTEE
OF THE S-10 SOUTHERN REGIONAL BEEF CATTLE BREEDING PROJECT

Tifton, Georgia - Minutes - September 2, 1959

The Technical Committee of the S-10 Southern Regional Beef Cattle Breeding Project met at the Georgia Coastal Plain Experiment Station, Tifton, Georgia at 10:00 a.m. The following technical committee representatives were present:

T. B. Patterson, Alabama Agricultural Experiment Station, Auburn, Alabama
C. J. Brown, Arkansas Agricultural Experiment Station, Fayetteville, Arkansas
Marvin Koger, Florida Agricultural Experiment Station, Gainesville, Florida
B. L. Southwell, Georgia Coastal Plain Experiment Station, Tifton, Georgia
N. W. Bradley, Kentucky Agricultural Experiment Station, Lexington, Kentucky
R. S. Temple, Louisiana Agricultural Experiment Station, Baton Rouge, Louisiana
W. W. Green, Maryland Agricultural Experiment Station, College Park, Maryland
C. E. Lindley, Mississippi Agricultural Experiment Station, State College, Miss.
J. H. Gregory, North Carolina Agricultural Experiment Station, Raleigh, N. C.
W. C. Godley, South Carolina Agricultural Experiment Station, Clemson, S. C.
C. S. Hobbs, Tennessee Agricultural Experiment Station, Knoxville, Tennessee
T. C. Cartwright, Texas Agricultural Experiment Station, College Station, Texas
J. A. Gaines, Virginia Agricultural Experiment Station, Blacksburg, Virginia
H. E. Kidder, West Virginia Agricultural Experiment Station, Morgantown, W. Va.
C. M. Kincaid, S-10 Regional Coordinator, A.H.R.D., U.S.D.A., Knoxville, Tenn.
M. J. Burris, S.E.S.D., U.S.D.A., Washington, D. C.

The meeting was called to order by the chairman of the Technical Committee, Dr. W. W. Green. The minutes of the meeting of the Executive Committee which was held August 31, 1959 were read. The chairman called for discussion of and action on the recommendations made by the Executive Committee.

After discussion of the advisability of the appointment of a committee to study various phases of analyzing and reporting data, C. S. Hobbs moved that the Executive Committee appoint committees to review various areas of data collection and analyses. The motion was seconded by W. C. Godley. The motion carried.

The invitation of the NC-1 group to meet with them in Oklahoma was presented by the chairman. T. B. Patterson moved that the Executive Committee discuss the possibility of approval of such a meeting with Dr. R. E. Patterson, the Administrative Advisor, and after receiving his opinion, set the time, place and program for next year's meeting. The motion was seconded by Marvin Koger and was passed.

The chairman presented the problems encountered because of S-10 officers assuming duties January 1 instead of at the close of the business meeting. B. L. Southwell moved that the following recommendations of the Executive Committee be accepted: "Commencing with the 1959 meeting, new officers shall assume all responsibilities of office immediately after adjournment of the meeting at which they are elected to office except for completion of unfinished business which shall remain the responsibility of the outgoing officers. Included as unfinished business shall be the preparation of the annual report, the responsibility of the outgoing chairman, and the minutes of the meeting, the responsibility of the outgoing secretary." The motion was seconded by C. J. Brown and was passed.

J. W. Cole presented the recommendations of the committee on the evaluation of beef from breeding project steers. Serving on the committee were J. W. Cole, Chairman, W. R. Backus, Otis Mullins, Dick Alsmeyer, L. E. Orme, Don Kropf and G. T. King. The recommendations are given below.

I. Institutions with no meat facilities
   A. Live animal evaluation
      1. Subjective scores for type, grade, condition, meatiness, etc.
      2. Objective scores
         a. Circumference of heart girth, middle, hind flank, circumference and length of foreshank, circumference and length of fore and hind cannons for estimation of bone, use of such devices as ultra-sonics, etc.
      3. Accurate and standard off-feed weight and kill weight, with a standare pre-slaughter shrink (24 hours).

   B. Data to be collected at a cooperative packing plant.
      1. Hot and chilled carcass weight (hot weight only - should shrink carcass weight 2 1/2% for yield).
      2. Carcass measurements as outlined in proceedings of 4th Annual R.M.C., and any others that show promise. This would include a "rib-eye" tracing with fat covering.
      3. Carcass grade (U.S.D.A. grade and carcass committee if possible). Include conformation, maturity, degree of marbling, along with final grade.
      4. Subjective marbling score based on the 12 descriptive adjectives from the U.S.D.A. beef grading standards.
         Ext. abund., Very abund., Med. abund., Sli. abund.
         Moderate, Modest, Small amt., Sli. amt., Traces, Pract. devoid, Devoid.
   C. Purchase of one complete wholesale rib for the following analysis:
      Rib should be broken into the 12th Rib Sec., the 9-10-11 Rib. Sec. and the 6-7-8 rib section according to Hankins and Howe. Record aging time and temperature of aging.
      1. 12th Rib Section - use as a broiled steak for shear strength and taste panel scores or the excised L.D. could be used for ether extract as an objective measure of marbling.
      2. 9-10-11 Rib Section - use for physical separation, CHEMICAL analysis and specific gravity.
      3. 6-7-8 Rib Section - use as an oven roast for taste panel scoring, cooking losses and shears.

   D. Possible consumer preference studies in retail stores or by use of composite quarters or sides of beef (Missouri style) with cooperation of locker plant and test families. This would probably require cooperation of other departments such as Ag. Economics.

II. Institutions with limited facilities.
   The following is suggested in addition to the suggestions of Section I.
   A. Slaughter animals in Exp. station abattoir, according to the procedure outlined in the 4th Annual R.M.C. proceedings.
   B. Break carcass into wholesale cuts according to procedure outlined in the 6th Annual R.M.C. proceedings.
   *C. More detailed carcass information such as -
      1. Specific gravity of a part or whole carcass.
      2. More complete physical separation.
      3. More controlled and varied taste panel data.

*D. With the cooperation of allied departments - other tech. may be attempted such as:
   1. Color determinations.
   2. Hist. studies.
   3. Bact.
   4. More complete chem. det.
   5. Bone hardness studies.
   6. Etc.

III. Institutions with more complete meat laboratory facilities.
The addition to Sections I and II, the following are suggested:
A. Greater emphasis on chem. det.
B. Use of isotopes in many ways
   1. Deposition, metabolism and assimilation
   2. To assay food additives
   3. Fasting effects on carcass
   4. To determine activity of autolytic enzymes.
C. More complete correlation of the live animal to carcass and organoleptic qualities; e.g., live animal biopsy tech.
D. Use of small animal lab for nutritional studies.
E. More detailed consumer preference and information research.
F. Exploratory research; e.g., development of further objective measures of eating quality.

The following questions were asked concerning the report of the committee. (The answers given by J. W. Cole and comments by others follow each question):

Q. What about carcass length?
A. That would be included in the measurements recommended.

Q. Will it take large numbers to show treatment differences in chemical measurements?
A. Use as many as possible. Trends may be established without statistical significance.

Q. Should aging standards be considered?
A. Shorter aging periods tend to maximize differences. Both time and temperature are involved in aging and both must be considered in a standard.

Q. Does aging have a uniform effect?
A. Aging effects are not uniform for all cattle.

Q. Should we consider absolute values more than we do now?
A. Perhaps we should consider the amount of lean produced and not concern ourselves so much with the fat that is attached.

Q. Why does the packer pay more for higher grades?
A. The packers claim that they can afford to do the trimming to gain any advantage in tenderness and flavor. A lot is tied into advertising.

Q. To what extent are we working with a selected sample that may bias our correlations, etc?
A. This may be a real point to consider. Our station cattle are the best source since more is known about the history of these cattle.

Q. What consideration should be given to differences in sexes in evaluating carcasses?
A. Good question - no answer.

No action was taken on the recommendation of the Meats Committee.

The motion was made by Dr. C. S. Hobbs that the Executive Committee communicate with R. E. Patterson concerning their proposal for a 10-year report of progress or summary of results of work in the S-10 region. If recommendation and approval was forthcoming from Dr. Patterson, C. M. Kincaid is to be in charge of preparing a summary with the assistance from any technical committeemen as needed. The motion was seconded by Dr. C. E. Lindley and was passed.

Dr. Kincaid was asked to report on the progress of the regional crossbreeding bulletin. He stated that some items from the states with data were missing but that most of the data were in his hands.

Dr. E. J. Warwick was asked to report on the response of breed associations to the registry of animals resulting from artificial insemination and from deceased sires Dr. Warwick stated that he had contacted all major breed associations and only the American Brahman Breeders Association indicated willingness to accept the proposal. Dr. Warwick also discussed the proposed National Frozen Semen Bank and several possible research uses. The major drawbacks appeared to be that animals produced from such semen would not be eligible for registration and the hesitancy of taking money from regional research projects and putting it into an inter-regional project. Motion was made by Marvin Koger that the S-10 chairman and S-10 coordinator meet in Chicago with the proposed national meeting regarding the formation of the inter-regional semen bank. It was seconded by J. A. Gaines. The motion passed.

There was no new business presented by the members of the Technical Committee.

Dr. Kincaid was asked for any additional comment from the regional coordinator. He requested that allocations of funds listed on reports be rechecked since there were some apparent errors. (See table A for RRF and AHRD funds). Dr. Kincaid reported that he had arrived at an approximate cost figure of $190 for maintaining a breeding cow for conducting S-10 breeding research.

Dr. Ralph Bogart, immediate past chairman of the W-1 Regional Beef Cattle Breeding Project, was asked to comment on the S-10 meeting. He expressed his pleasure of being able to attend the meeting and complimented the group on their work. He commented on the emphasis the S-10 group has placed on weaning weight and on carcass characters with little attention being given to post-weaning rate and efficiency of gain under standardized conditions. He suggested that it would be well to not overlook these items. In the W-1 region the work has been predominately selecting in the development of lines of beef cattle, work with blood types, deleterious genes, metabolism studies, and generally pursuing the answer to why some cattle are good doers and others poor doers. Standardization of testing procedures might be questioned since ranch to ranch differences have been found to be quite large. On the ranch testing seems more logical, especially where there are large operators. Dr. Bogart then mentioned the three methods of gain testing.

I. To a constant finish.
II. Over a time constant period.
III. From one fixed weight to another fixed weight. At Oregon this procedure is used. The cattle are tested from an initial weight of 500 pounds to a final weight of 800 pounds. It is felt at Oregon that gain is largely a function of weight. The ration used is two parts roughage and one part concentrate in a pelleted feed. Considerable variability was noted in rate of gain and feed consumed per cwt. gain. It appeared from blood amino acid and blood and urine urea studies at Oregon that the amino acids are pulled out of the blood stream in the good doers and vice versa in the poor doers. Phosphatase activity was higher in good doers and probably was associated with bone growth. Dr. Bogart felt that less fat and more protein and water are produced in high gainers obtained either through selection procedures or by the use of hormones. Dr. Bogart also commented on the isotope studies at Washington State College. Animals in the intermediate range of thyroid activity had better gains than those that were either hypo or hyper in thyroid activity. He also pointed out the importance of a good balance between popular publications and scientific articles in order to fulfill our obligations. He concluded with an invitation for S-10 personnel to meet with the W-1 Region.

Dr. Luis Rivera Brenes was asked to comment on the work in Puerto Rico. The lack of sufficient land for beef cattle is a serious problem and dairy cattle will probably continue to predominate. Eight breeds have been imported to Puerto Rico for observation; these include: Hereford, Angus, Brangus, Charbray, Charolaise, Brahman, Shorthorn and Red Poll. It appears that a little Brahman blood is necessary for good production in Puerto Rico because of the steep, rough terrain. Testing has been started on four breeds: Charbray, Charolais, Brangus and Brahman. The tests are on pasture and are used to sift bulls for release to producers. It appears that cull dairy cows might form a good base for the establishment of beef herds.

Dr. E. J. Warwick was asked for his comments. He expressed pleasure at the general progress of the project but reported that the central office complained that there were too many projects with the same title. The titles of projects should be made more descriptive. Because of the lack of funds on which to draw, it appears that additional help for the Regional Coordinator is not likely in the near future.

Dr. M. J. Burris from the State Experiment Stations Division was asked for his comments. He expressed the opinion that more discussion of the projects and of results would enhance the value of the annual meeting. The reports appeared too formal and perhaps failed to bring about as much interchange of ideas and discussio on problems and approaches to problems as would be desirable in a regional project. Dr. Burris noted that financial support for the S-10 projects was somewhat better than for either W-1 or NC-1 projects. He also pointed out that project outlines should be specific and kept up to date.

The report of the resolutions committee given by C. J. Brown was as follows: In appreciation for the wonderful hospitality and excellent facilities provided for the technical committee members, co-workers and guests by the Georgia Coastal Plain Experiment Station, be it resolved that the secretary write a letter expressing the appreciation of this group to Director King, Mr. B. L. Southwell and Dr. W. C. McCormick and their associates.

Be it further resolved that the secretary write a letter to Mr. R. P. Balkcom Jr Warden, Georgia State Prison, expressing our appreciation for the fine hospitality and excellent tour arranged by Mr. Hamilton Ralls, Mr. Allen Rodgers, Mr. T. M. Clyburn and Mr. J. N. Maddux on Tuesday afternoon.

Be it further resolved that the secretary write a letter expressing the appreciation of this group to Mr. George P. Donaldson, President of Abraham Baldwin College for providing the facilities and arranging the luncheon on Monday. A copy of this letter to be sent to Mrs. Stansill.

Be it further resolved that the secretary write a letter to Dr. Glen Burton thanking him for the inspiring and informative talk on Monday evening.

Respectfully submitted: W. C. Godley
C. S. Hobbs
C. J. Brown

A motion to accept a report of the resolutions committee was made, seconded and passed.

Dr. W. C. Godley was elected to the Executive Committee to succeed Dr. W. W. Green whose term expires at the end of the current meeting.

An invitation to the Technical Committee was given by W. C. Godley to hold next year's annual meeting in South Carolina at Clemson College. In the event that next year's meeting is held out of the region the invitation was extended for the 1961 meeting. The meeting was adjourned by the chairman at 12:00 noon.

Table A

REGIONAL RESEARCH AND ANIMAL HUSBANDRY RESEARCH DIVISION
FUNDS ALLOCATED TO S-10 STATE PROJECTS
FISCAL 1959 and 1960

STATE	R.R.F. Funds 1959	R.R.F. Funds 1960	A.H.R.D. Funds 1959	A.H.R.D. Funds 1960
Alabama	10,750	19,842	2,400	2,400
Arkansas	11,000	11,000	3,000	3,000
Florida*	6,000	8.700	2,500	2,500
Georgia	5,500	5,500	4,640	4,640
Kentucky	9,300	9,300		
Louisiana*	6,000	6,000		
Maryland				
Mississippi	8,000	7,000	2,400	2,400
North Carolina	9,350	9,350	1,800	1,800
South Carolina				
Tennessee	9,000	9,000	11,400	11,400
Texas	10,000	10,000	8,200	8,200
Virginia*	6,000	6,000	6,100	6,100
West Virginia				
TOTALS	90,900	101,692	42,440	42,440

*Does not include A:H:R:D: funds at Brooksville, Fla., Jeanerette, La. and Front Royal, Va.

THE RELATIVE SIGNIFICANCE OF FACTORS AFFECTING BEEF TENDERNESS

-by-
R. H. Alsmeyer, A. Z. Palmer and M. Koger[1]

Of the palatability attributes of beef, tenderness is one of the most important. The meat industry has shown marked interest in the problem of beef tenderness; research in this area has increased very materially during the past few years. The validity or usefulness of two basic concepts of carcass merit has been questioned--the questioned principles are that marbling contributes to tenderness and the idea that carcass maturity or age of the animal at time of slaughter influences tenderness.

Although singular effects of finish and/or marbling, age at time of slaughter and breeding are reported in the literature, little was known of the relative significance of the major factors influencing and/or associated with beef tenderness.

The purpose of this investigation was to study the relative effects of grade, marbling, age at time of slaughter and breeding on beef tenderness.

EXPERIMENTAL

Study 1

The two hundred and eighty-one animals used in this study were raised at the Range Cattle Station, Ona, Florida. Breeding was predominantly Brahman and Shorthorn; experimental animals were sired by eight Brahman, six Shorthorn and two Shorthorn x Brahman crossbred bulls. One hundred and fifty-six progeny were sired by Brahman bulls, one hundred and fifteen progeny by Shorthorn bulls and ten progeny by crossbred bulls. Ages at time of slaughter ranged from 5 to 87 months with an average of 18.8 months. Forty-eight hours following slaughter, carcasses were graded to the nearest one-third of a grade by a USDA Federal meat grader. Carcass grades ranged from low canner to low prime and averaged between high standard and low good. Marbling scores given by the federal grader ranged from devoid to moderately abundant and averaged between traces and slight amount of marbling. A six inch section of short loin was removed from the left side of the carcass, forty-eight hours after slaughter, and immediately wrapped for freezer storage, frozen and held at 0°F. until tests were made. Steaks one inch in thickness were cut from short loin sections and thawed at 36°F. for twenty-four hours. Adjacent steaks for panel and shear tenderness evaluation were broiled simultaneously in electric ovens to a uniform "medium" degree of doneness. The longissimus dorsi (eye) muscle was removed from the broiled steak and trimmed of exterior fat and connective tissue. The muscle was cut perpendicular to its long axis into four samples and served to a four member tenderness panel. To avoid possible variations in tenderness within the muscle, a panel member consistently received samples from the same area of the steak. Three one-half inch diameter cores were obtained along a line at midpoint of the muscle and parallel to its long axis. Each core was sheared twice using the Warner-Bratzler shear apparatus. Through replication, averages of eight taste panel and twelve Warner-Bratzler shear evaluations were obtained for each carcass.

Estimates of heritability were derived by the method of intraclass correlation of offspring of sires of the same breed. Covariance analysis was used to adjust for age at slaughter in mean square errors of estimate.

[1]Alsmeyer, Agricultural Fellow, Palmer and Koger, Associate and Animal Husbandmen, respectively, Florida Agricultural Experiment Station

RESULTS AND DISCUSSION

Study 1

The gross effects of breed of sire and of sire within breed are shown in Table 1 by use of average panel tenderness values. It may be noted that the average observed panel tenderness scores for sires vary markedly. Among Brahman sires, average values ranged from 4.45 to 3.24 while among Shorthorn sires average values varied from 4.35 to 3.95. The means for crossbred sires may not be representative due to small numbers of progeny sampled. As shown in Table 1, adjustments for age at time of slaughter alter sire means only slightly; however, on an adjusted mean basis two Brahman sires were most tender of all sire groups and three were above average in tenderness. The frequency distribution of panel tenderness scores for Brahman and for Shorthorn progeny was slightly skewed with sixty percent of the Brahman progeny below average in tenderness and sixty-one percent of the Shorthorn progeny average or above.

Table 1
OBSERVED AND ADJUSTED[1] PANEL TENDERNESS SCORES[2] BY SIRES AND BREEDS

BRAHMAN		SHORTHORN		CROSSBRED	
Observed	Adjusted	Observed	Adjusted	Observed	Adjusted
4.45	4.50	4.36	4.30	3.52	3.51
4.25	4.38	4.28	4.23	2.60	2.58
4.21	4.21	4.11	4.16		
3.59	3.56	4.08	4.07		
3.50	3.53	3.99	3.97		
3.41	3.39	3.95	3.98		
3.37	3.29				
3.24	3.27				
3.59	3.59	4.13	4.11	3.15	3.14
Breed Mean					

[1]Adjusted for age at slaughter
[2]Panel tenderness scale as follows: Excellent 6, Above average 5, Average 4, Slightly tough 3, Extremely tough 2, Inedible 1.

Differences due to sires, breed of sire and sires within breed were all highly significant for both tenderness measures. However, tenderness differences among Shorthorn sires were insignificant, while differences among Brahman sires were highly significant for both panel and shear values (Table 2).

Heritability estimates measure the extent to which differences in heredity influence tenderness differences between animals. The heritability estimates (Table 3) derived from Brahman sires were 71 and 54 percent for panel and shear tenderness values, respectively. Heritability estimates for Shorthorn sires were zero for both tenderness measures. Shorthorn sires used in this study were quite similar genetically and thus hereditary differences in tenderness should not be expected to be pronounced. The genetic similarity of most of the Shorthorn sires was the result of a program of rather close line breeding. Kieffer et al. (7) recently reported differences in tenderness among Angus sire groups with an estimate of heritability of 92 percent for tenderness by shear. To show the overall genetic effect of sires on tenderness, pooled heritability estimates were computed for sires within breed; estimates were fifty-seven percent and forty-nine percent for tenderness evaluations by panel and Warner-Bratzler Shear, respectively. Differences in

tenderness and relatively high estimates of heritability among Brahman sires suggests the possibility for progress through breeding for tenderness.

To study the relationships of age at slaughter, marbling and carcass grade to tenderness as influenced by breed of sire, simple, partial and multiple correlation coefficients were computed on a within sire basis for all progeny, Brahman progeny and Shorthorn progeny. Data are presented in Table 4. With marbling held constant, the effect of slaughter age on panel tenderness was more pronounced among Shorthorn than among Brahman progeny with highly significant coefficients of -.39 and -.26, respectively. Among all progeny, slaughter age, with marbling constant, had only a slightly stronger influence on panel tenderness than did marbling with age constant.

Table 2
ANALYSIS OF VARIANCE FOR TENDERNESS EVALUATION
BY PANEL AND WARNER-BRATZLER SHEAR BY BREED OF SIRE

SOURCE	df	Panel Mean Square	Shear Mean Square
Brahman Sires			
Total	154		
Within Sires	147	0.854	9.230
Brahman Sires	7	3.176**	27.914**
Shorthorn Sires			
Total	113		
Within Sires	108	0.670	6.778
Shorthorn Sires	5	0.196	4.214

** Significant at .01 level

Table 3.
HERITABILITY ESTIMATES FOR TENDERNESS BY PANEL AND SHEAR BASED ON INTRACLASS CORRELATION OF HALF SIBS

Sires Used in Estimate	Heritability Panel	Shear
	Percent	Percent
Brahman sires	72	54
Shorthorn sires	0	0
Pooled, sires within breed	57	49

When age was held constant, marbling influenced the tenderness of Brahman progeny more than Shorthorn progeny. Holding age constant, a highly significant partial correlation coefficient of .29 was found between marbling and panel tenderness for Brahman progeny whereas the corresponding coefficient for Shorthorn progeny was a significant .20. Holding age constant, marbling among Shorthorn progeny had only a slight relationship with panel tenderness and accounted for 3.9 percent of panel tenderness variability.

The multiple correlation coefficient is a measure of the combined effects of two independent variables on a dependent variable. Since marbling and age are the main factors determining carcass grade, multiple correlations of tenderness score with marbling and age could be compared to simple correlations between grade and

tenderness. Among Shorthorn progeny, a multiple correlation coefficient of .39 was obtained whereas the simple correlation between carcass grade and panel tenderness was -.28, indicating that age and marbling affected tenderness slightly more than did carcass grade, the negative sign in the grade correlation being due to coding used in analysis. Marbling and slaughter age showed a slightly greater relationship to panel tenderness than did carcass grade among all progeny, regardless of breed of sire.

Table 4
SIMPLE, PARTIAL AND MULTIPLE CORRELATIONS OF GRADE (x_1), SLAUGHTER AGE (x_2) AND MARBLING (x_3) WITH TENDERNESS PANEL (y_1)

SOURCE OF VARIATION		COEFFICIENTS OF CORRELATION		
		ALL PROGENY	BRAHMAN[1]	SHORTHORN[2]
Correlation				
r_{y2}	age effect	-.28**	-.18*	-.34**
r_{y3}	marbling effect	.26**	.31**	.20*
$r_{y2\cdot3}$	age effect (marbling constant)	-.28**	-.26**	-.39**
$r_{y3\cdot2}$	marbling effect (age constant)	.26**	.29**	.20*
$R_{\cdot23}$	(marbling and age constant)	.38**	.40**	.39**
r_{y1}	grade effect	-.34**	-.37**	-.28**

1 Brahman progeny
2 Shorthorn progeny
* Significant at .05 level
** Significant at .01 level

As shown in Table 5, age at slaughter, with marbling held constant, was not significantly correlated with tenderness by shear among Brahman progeny; however, among Shorthorn progeny a highly significant partial correlation coefficient of .35 was obtained when marbling was held constant. A partial correlation coefficient of .25 was found between slaughter age and tenderness by shear among all progeny, with marbling held constant, shereas a partial correlation coefficient of -.35 was obtained between marbling and tenderness shear when age was held constant. Thus marbling influenced shear tenderness more strongly than did age at slaughter. With age held constant, marbling showed a stronger relationship with tenderness shear among Brahman progeny than among Shorthorn progeny. The combined effects of marbling and age on tenderness by shear among Brahman progeny was more pronounced than the effect of carcass grade which did not correlate significantly with this measure of tenderness. Among all progeny and Shorthorn progeny, carcass grade correlated equally as well with tenderness by shear as did the combined effects of marbling and age.

Preliminary data as to the relative significances of factors influencing or associated with beef tenderness are presented in Table 6. Breed of sire and the sires within breed were the two factors accounting for the highest percentage of variability in tenderness; breed of sire accounted for 13.6 percent and sires within breed 14.3 percent. Carcass grade accounted for 11.5 percent of the variability in tenderness. In this study, Shorthorn progeny outgraded the Brahman progeny. Hence some tenderness variability attributed to carcass grade could be sire effect; further certain variability attributed to breed of sire and sires within breed could be

carcass grade effect. Age at time of slaughter and marbling accounted for 8.1 and 6.9 percent of the variability in tenderness. Variability of panel tenderness accounted for by breed of sire and sires within breeds suggests that these factors outweigh increases in tenderness gained through increased marbling and youthfulness.

Table 5
SIMPLE, PARTIAL AND MULTIPLE CORRELATIONS OF GRADE (x_1), SLAUGHTER AGE (x_2) AND MARBLING (x_3) WITH TENDERNESS BY WARNER-BRATZLER SHEAR TECHNIQUE (y_2)

SOURCE OF VARIATION		COEFFICIENTS OF CORRELATION		
		ALL PROGENY	BRAHMAN[1]	SHORTHORN[2]
r_{y2}	age effect	.24**	.17	.35
r_{y3}	marbling effect	-.35**		-.26**
$r_{y2.3}$	age effect (marbling consta	.25**	.06	.35**
$r_{y3.2}$	marbling effect (age constant)	-.35**	-.41**	-.27**
R·23	(Marbling and age constant)	.42**	.20*	.43**
r_{y1}	grade effect	.50**	.12	.43**

1 Brahman progeny
2 Shorthorn progeny
* Significant at .0 level
** Significant at .01 level

Table 6
PERCENT OF TENDERNESS VARIABILITY ACCOUNTED FOR BY THE FACTORS STUDIED -- ALL PROGENY

Factor	Panel tenderness percent	Shear tenderness percent
Breed of sire	13.6	5.4
Sires within breed	14.3	12.2
Carcass grade	11.5	20.2
Age at time of slaughter	8.1	6.3
Marbling	6.9	12.4

Table 7
THE RELATIONSHIP OF BEEF TENDERNESS AND AGE OF ANIMAL AT TIME OF SLAUGHTER

Degree of marbling		Number Animals	Coefficients of Correlation r
Devoid		46	.251
Practically devoid		112	.231*
Traces		129	-.056
Slight		129	.068
Small		64	.121
Modest		22	.031
	All degrees of marbling	502	.153**

* Significant at .05 level ** Significant at .01 level

Study 2

To further evaluate the tenderness effects of age of animal at time of slaughter, marbling and carcass grade, disregarding breed and sire, tenderness evaluations of 180 of the carcasses used in Study 1 were combined with 322 carcasses of undetermined genetic background to provide a total of 502 carcasses for study 2. Carcass chilling, sampling and steak broiling methods of Study 2 were similar to methods employed in Study 1. All carcasses were from animals ranging in age at time of slaughter from 5 to 30 months.

Simple correlation coefficients between tenderness values obtained by panel and age at time of slaughter for each marbling group were calculated.

The relationship of beef tenderness and age of animal at time of slaughter is presented in Table 7. Within degrees of marbling devoid, slight, small and modest, positive but insignificant relationships were obtained between tenderness and age of animal at slaughter. A positive significant correlation coefficient of .23 was found between tenderness and age within carcasses with traces of marbling. Although the relationships lacked significance and magnitude, the positive signs indicate that within carcasses from animals 5 to 30 months of age tenderness increased slightly with age. A highly significant correlation coefficient of .15 was obtained between tenderness and age at slaughter using the 502 animals without respect to degree of marbling.

Using data from the above animals, simple correlations between marbling and federal grade for both tenderness measures, shown in table 8.were highly significant, and yet, variability of grade explained only 5.6 percent of panel tenderness variability whereas marbling accounted for 8.0 percent.

Table 8
SIMPLE CORRELATIONS BETWEEN FACTORS RELATED TO BEEF TENDERNESS
TOTAL NO. ANIMALS - 502

Sources of Variation	Coefficients of Correlation	Percentage of variation accounted for
	r	$r^2 \times 100$
Federal grade and		
Marbling	.740**	54.8
Tenderness score	.237**	5.6
Shear force value	-.228**	5.2
Marbling and		
Tenderness score	.283**	8.0
Shear force value	-.285**	8.1
Tenderness score and		
Shear force value	-.806**	65.0

** Significant at .01 level

SUMMARY AND CONCLUSIONS

1. Beef tenderness was found to be heritable. Brahman progeny were less tender than Shorthorn progeny. Heritability estimates derived from Brahman sire groups were 72 percent and 54 percent for tenderness evaluation by tenderness panel and shear force, respectively. Estimates obtained from Shorthorn sire groups were zero for both measures of tenderness.

2. Among animals 5 to 30 months of age, tenderness by panel increased slightly with increases in age. With animals 5 to 87 months of age, tenderness declined with age. These data point out the need for further study to determine the specific effect of age on beef tenderness. Slaughter age was more highly associated with tenderness among Shorthorn progeny than marbling, among Brahman progeny, marbling was more important.

3. Marbling accounted for 6.9 percent of the variability in tenderness in Study 1 and 8.0 percent in Study 2.

4. Carcass grade accounted for 11.5 percent of the variability in tenderness in Study 1 and 5.6 percent in Study 2.

5. Tenderness was influenced slightly more by the combined effect of marbling and age than by carcass grade.

6. Breed of sire and sires within breed accounted for more panel tenderness variability than carcass grade, marbling or slaughter age.

7. The relatively high heritability estimates and the pronounced effect of breed of sire on tenderness add strength to the possibility of maintaining or improving tenderness of beef through tenderness testing and selection.

DIFFERENCES IN BEEF CARCASSES AND RELATED MEASUREMENTS

-by-
G. T. King

The two primary value determining characteristics of the beef carcass are quality and cutability. These two characteristics are far from being perfectly correlated. Therefore, beef carcass evaluation requires quantitative and qualitative measurements and estimates. The distribution of the carcass weight among the lean, fat, and bone components is important. The distribution of the weight among the standard wholesale cuts and the trimmed retail cuts is of great importance. The appearance of the retail cuts and the palatability of the cooked beef steaks, roasts, and other products is of the greatest importance.

Quality, as referred to here, is a combination of the following characteristics: maturity, intramuscular fat (marbling), color and firmness. These characteristics are supposed to be closely related to tenderness, juiciness, and flavor when the final product is served on the dinner table. One of these eating characteristics--tenderness--has already been discussed and others are to follow in the program. Therefore, I will confine my remarks to the characteristic of cutability.

Conformation, finish, and dressing percentage have long been the principal factors affecting the price of slaughter steers of the same weight and age range. Conformation has been appraised on the basis of descriptive adjectives and the "ideal" has been a steer which is extremely short bodied, or compact, with extreme width and thickness, extreme depth, and very short legs. Bulge of round has been emphasized. These factors have been associated with "early maturity," ease of fattening and carcass desirability as measured by the distribution of weight among the various wholesale cuts and among the carcass components of lean, fat, and bone.

Beef carcasses vary widely in percentage of lean, fat, and bone. Consumers are interested in the lean component almost exclusively. People simply do not want much fat on meat, do not eat and resist paying for very much of it. Fat, however, contributes to juiciness and flavor of beef and seems to have a minor positive effect on tenderness. A moderate fat covering adds to the attractiveness of beef cuts and has a protective effect on storage and during cooking. Excessive fat is a very expensive wrapper.

Cattle tend to develop proportionately. The various muscles and bones have a distinct size relationship. Since wholesale cuts are made according to skeletal check points, there is little variation in the percentage of the carcass found in the 10 standard wholesale cuts of carcasses of the same fatness. Fat is deposited unevenly, as fattening progresses. The first outside carcass fat appears over the back and along the underline. As fattening progresses the fat extends towards the head and tail and becomes thicker over the back and along the underline. The last areas to be covered with fat are the lower round and the front and lower part of the shoulder, or chuck. Fat, thus, upsets the proportionality of the cuts. As fattening progresses the percentages of round and chuck decrease and the percentages of brisket, shortplate and shank increase. The percentages of wholesale rib and full loin tend to remain rather constant, but when the outside fat is trimmed to a "retail" basis of about one-fourth inch, their percentage also declines.

Moderate fattening seems to increase the yield of lean meat, probably by deposits within and between muscle cells. The lean-bone ratio of some very lean mature cow carcasses was determined to be 3.5:1 by physical separation into lean, fat, and bone. Similar cow carcasses after moderate fattening showed a lean-bone ratio of 4:1.

Shortness of body and shortness of leg do not increase the yield of preferred cuts. Neither to length of leg and length of body. Superior muscling makes a difference. However, in either case an either short bodied or long bodied steer with superior muscling will show an increase in percentage of preferred cuts. Other considerations, then, such as the amount of walking the cattle are expected to do, rate of gain, etc., may be more important to the breeder in establishing his ideal for length of body and length of leg.

Extreme depth of body tends to reduce the percentage of preferred cuts. It is logical that such would be the case. Depth of body is associated with capacity of digestive tract and reproductive tract and with chest capacity, however, and we at the Texas Agricultural Experiment Station are not advocating selection towards shallow-bodied cattle. There should be a compromise depth, which would be adequate for production efficiency and which would have only a slight negative effect on yield of preferred cuts. There seems to be no good justification for an ideal which favors continually increasing depth of body.

Thick bones seem to go with thick muscles rather consistently. To determine the relationship of muscle to bone a study was made on 132 steers that ranged in age from 150-600 days. The respective slaughter and carcass weights ranged from 370-1244 pounds and 215-786 pounds. Five locations, five breeds and ten crossbreeds were represented in the study. Carcass grades ranged from U.S. Standard to U.S. Choice. All of the long bones of the thoracic and pelvic limbs, except the humerus, were correlated with various carcass measurements; primarily, the major standard wholesale cuts. These data showed a very close positive relationship between bone weights and bone lengths.

Table 1. Coefficients of Correlation Between Trimmed Bone Weight

	Metatarsus	Radius-Ulna	Tibia	Femur
Metacarpus	.966***	.964***	.905***	.899***
Metatarsus		.941***	.905***	.883***
Radius-Ulna			.914***	.914***
Tibia				.950***

*** P< .001

Table 2. Group Coefficients of Correlation Between Weight and Length of Bone

	Bone Length						
Bone Weight	Group 1[a]	Group 2[b]	Group 3[c]	Group 4[d]	Group 5[e]	Group 6[f]	Group 7[g]
Metacarpus	.762	.780**	.727**	.640*	.869**	.822**	.750**
Metatarsus	.638	.761**	.669**	.786**	.924**	.900**	.782**
Radius-Ulna	.820	.780**	.670**	.713**	.969**	.910**	.830**
Tibia	.917*	.662**	.516**	.810**	.968**	.810**	.817**
Femur	.939*	.750**	.697**	.744**	.935**	.885**	.849**

*P< .05
**P< .01

a. Group 1-6 Hereford steers ranging in age from 150-325 days
b. Group 2-29 Hereford steers ranging in age from 326-450 days
c. Group 3-31 Hereford steers ranging in age from 451-600 days
d. Group 4-15 crossbred steers (3/4 Brahman x 1/4 Hereford) ranging in age from 382-416 days
e. Group 5-12 crossbred steers (1/2 Charolais x 1/4 Hereford x 1/4 Brahman) ranging in age from 172-428 days
f. Group 6-66 Hereford steers all ages.
g. Group 7-132 steers combining all breeds and ages

Gross simple coefficients of correlation between trimmed bone weight and carcass measurements, as shown in Table 3, were all highly significant. The same was also true for the bone area of metatarsus and metacarpus and the weight-length ratio of metatarsus and metacarpus, tibia, and femur. These data are shown in Table 4. The 132 steers were divided into age and breed groups from 5 locations and coefficients of correlation calculated. The same relationship existed as has been shown in the previous tables when treated on a group basis.

Table 3. Group 7[a]: Gross Simple Coefficients of Correlation Between Trimmed Bone Weight and Carcass Measurements

	Bone Weight				
Carcass Measurements	Metacarpus	Metatarsus	Radius-Ulna	Tibia	Femur
Cushion Round and rump wt.	.635***	.575***	.678***	.579***	.613***
Loin Weight	.671***	.651***	.741***	.641***	.668***
Rib Weight	.570***	.542***	.650***	.530***	.565***
Sum Loin, Rib, Round and Rump Weight	.682***	.668***	.753***	.651***	.674***
Ribeye Area (sq. in.)	.486***	.478***	.545***	.456***	.468***
Chilled Carcass Wt.	.673***	.651***	.746***	.640***	.669***

***P< .001 a. Group 7: 132 steers combined, all ages and breeds

Table 4. Group 7[a]: Gross Simple Coefficients of Correlation Between Bone Area, Weight-Length Ratio and Carcass Measurements

	Area		Weight-Length Ratio			
Carcass Measurements	Metacarpus	Metatarsus	Metacarpus	Metatarsus	Tibia	Femur
Cushion Round and Rump Weight	.504***	.443***	.770***	.734***	.602***	.607***
Loin Weight	.582***	.547***	.792***	.800***	.644***	.655***
Rib Weight	.726***	.717***	.546***	.564***	.519***	.479***
Sum Loin, Rib, Round Rump Weight	.582***	.565***	.796***	.814***	.653***	.659***
Ribeye Area (Sq. in.)	.439***	.450***	.593***	.604***	.456***	.433***
Chilled Carcass Wt.	.796***	.800***	.644***	.656***	.592***	.565***

***P< .001 a. Group 7: 132 steers combined, all ages and breeds

Partial coefficients of correlation (holding carcass weight constant) were calculated for the various groups and the combined group of 132 steers. Partial coefficients of correlation reduced the significance of muscle-bone relationship remarkably. However, when a hierarchial (nested) analysis of variance was calculated to test the influence of location, breeds and sires it was found that the variable location exerted the greatest influence on all bone characteristics. Included in the variable "location" was animal weight, age, treatment, and location. One of these analysis is shown in Table 5.

Table 5. Mean Square Values for the Influence of Location, Breed, and sire on Bone Area and Weight-Length Ratio of all Bones

Source of Variation	D.F.	Area		Weight - Length Ratio			
		Metacarpus	Metatarsus	Metacarpus	Metatarsus	Tibia	Femur
Location	5	0.119**	0.112**	2.483**	2.219**	5.058**	11.757**
Breed Within Location	15	0.062**	0.063**	0.563**	0.568**	1.719**	4.024**
Sires Within Breed Within Location	27	0.013	0.030**	0.136**	0.149**	0.527	1.001

**P < .01

When partial coefficients (holding age constant) were calculated for metacarpus and metatarsus bones, the r value remained highly significant (Table 6). Age, therefore, must have the greatest influence on bone characteristics as related to muscling. The metacarpus and metatarsus bones from cattle within a breed, weight and age classification are reliable indicators of muscling.

Table 6. Partial Coefficients of Correlation Holding Age Constant Between Trimmed Bone Weights, Bone Areas, Weight/Length Ratio and Various Wholesale Cuts and Rib Eye Area

	METACARPUS			METATARSUS		
Item	Weight	Area	W/L Ratio	Weight	Length	W/L Ratio
Cushion Round and Rump Weight	.537***	.365***	.612***	.476***	.317***	.571**
Loin Weight	.643***	.510***	.640***	.648***	.505***	.652***
Rib Weight	.405***	.349***	.426***	.422***	.344***	.450***
Sum Loin + Rib + Round, Rump on	.657***	.506***	.648***	.671***	.535***	.720***
Rib Eye Area (sq. in.)	.307***	.260**	.276**	.330***	.325***	.330***

***P< .001
**P< .01
*P< .05

We know there are differences in cattle. How to measure these differences is not an easy task. The Texas Agricultural Experiment Station uses the attached form for collecting slaughter and carcass data. We have changed the form several times and I am sure there will be other changes. You can readily see that over 125 measurements are made on each animal. Time will only permit discussing a few of these measurements. Correlations and analysis of variance were calculated on 110 steers ranging in age from 198-620 days and slaughter and carcass weights from 360-1205 pounds respectively. Dressing percentage varied from 54.8 to 64.8 and carcass grade from U. S. Standard to U.S. Choice.

Average daily gain was highly correlated with chilled carcass weight per day of age, ribeye area and percent "retail trimmed" cuts of slaughter live weight. The relationship of production to desirable carcass characteristics is very important. It will require a combination of these factors to produce economical, desirable beef.

Table 7. Coefficients of Correlation Between Five Carcass Measurements

	Chilled Carc. Wt. per day of age	Ribeye Area	Ribeye area per cwt. Chilled Carcass	% "Retail Trimmed" Cuts of Sl. Wt.	Loin Shear Force Value
Average daily gain	.606**	.331**	.169	.198*	.120
Chilled Car. Wt./ day of age		.290**	.226**	.252**	.021
Ribeye Area			.244**	.275**	.042
Ribeye Area/cwt. Chilled Carc.				.072	.026
% "Retail Trimmed" Cuts of Sl. Wt.					.056

*P< .05
**P< .01

Chilled carcass weihgt per day of age is the best single measure that we have of production. This measure includes birth weight, milking ability of dam, rate of gain and feed efficiency. I. the 110 steers studied there was a range of .87 to 1.62 pounds with an average of 1.21 pounds. There was a highly positive significant difference between breeds within locations and years.

Table 8. Mean Squares for Influence of Years, Locations and Breeds Upon Two Beef Carcass Measurements

Source of Variation	D.F.	Chilled Carcass Wt. Per Day of Age (lbs)	Ribeye Area per Cwt. Chilled Carcass (sq.in.)
Total	109		
Between Years	1	0.0659	0.0072
Between Locations/Years	5	0.0402	1.4306***
Between Breeds/Locations/ Years	20	0.0694**	0.0489
Within Years	83	0.0167	0.0318

**P< .01
***P< :001

Ribeye area per hundred weight of chilled carcass is another good carcass measurement. Total ribeye area is a common carcass measurement but area per hundred weight of chilled carcass is a more reliable measure of muscling. The 110 steers studied showed there was a highly significant difference between locations but not between breeds. The average was 1.68 with a range of 1.34 to 2.92.

Lean, fat and bone components of the whole carcass are the three measurements we are most concerned with, but accurate determinations are difficult to make. Physical separation of the entire carcass is the most accurate method we have, but this requires long hard hours of work. Hankins and Howe developed a formula that has proven to be quite accurate. The technique requires separating only the 9-10-11 rib cut and estimating the percent of lean, fat, and bone of the carcass. There was a high positive significant difference between locations within years and between breeds for these three measurements in the 110 steers studied.

Table 9. Mean Squares for the estimated Percent of Lean, Fat, and Bone of the Carcass

Source of Variation	D.F.	Est. % Lean of the carcass	Est. % Fat of the carcass	Est. % Bone of the carcass
Total	109			
etween Years	1	26.4711	77.0887	13.8021
Between Location/Years	5	248.5640***	562.0074***	33.1982***
Between Breeds/Location/ Years	20	20.8052**	52.0998**	5.2324**
Within Breeds	83	7.9826	12.2052	1.4590

**P< .01
***P< .001

The three preferred wholesale cuts of the carcass--loin, rib, and round, rump on--should make up 48% or more of the carcass weight. These three cuts are the high priced cuts, as well as the most muscular. The chuck should also be included when we refer to muscling. It has been stated previously how fat influences the percent yield of these four cuts, the loin and rib remain about constant and the round and chuck decrease. Trimming all excess fat from the wholesale cut reduces this influence. A beef carcass should yield 38% or more of its weight in the loin, rib, round and rump after these cuts have been given a "retail trim." Table 10 shows the ranges and averages of both standard and "retail trimmed" wholesale cuts.

Table 10. Ranges and Averages of the Three Preferred Wholesale Cuts

Wholesale Cuts	Standard Wholesale Cut Range	Standard Wholesale Cut Average	"Retail Trimmed" Whls.Cut Range	"Retail Trimmed" Whls.Cut Average
Loin (%)	13.18-15.70	14.50	10.12-14.53	12.27
Rib (%)	7.16-9.99	8.57	5.14-6.99	6.28
Round, Rump on (%)	19.38-27.98	23.95	13.38-22.68	18.43
Sum Loin, Rib, Round, Rump (%)	41.38-53.54	47.78	31.76-39.62	37.61
Fat Trim (%)			3.39-16.95	8.98

Table 11 shows the effect of years, locations, and breeds on the yield of the three preferred cuts. Location showed the greatest influence. There was no significant difference between breeds for loin and rib. These two cuts were significant at the .05 level between breeds after they were "retail trimmed."

Table 11. Mean Squares for Percent of the Three Preferred Standard Wholesale Cuts of the Beef Carcass

Source of Variation	D.F.	Full Loin %	Rib %	Round, rump on %	Sum Loin, Rib, Rnd., rump on%
Total	109				
Between Years	1	0.6920	1.2183	448.5376*	8.8363
Between Locations/ Years	5	1.1682*	1.4108**	35.4757***	40.7788***
Between Breeds/ Locations/Years	20	0.3601	0.4229**	4.7035**	5.9352**
Within Breeds	83	0 2459	0.1274	0.8482	1.6137

*P< .05
**P< .01
***P< .001

Table 12. Mean Squares for Percent of the "Retail Trimmed" Preferred Cuts of the Beef Carcass

Source of Variation	D.F.	"Retail Trimmed" Loin %	"Retail Trimmed" Rib %	"Retail Trimmed" Round and Rump %	"Retail Trimmed" Loin, Rib Rnd., Rump %	Fat Trim %
Total	109					
Between Years	1	7.4791	5.0832	197.8157	82.4594	1.2737
Between Locations/ Years	5	11.2357***	0.4306	41.4009***	173.1585	126.0561**
Between Breeds/ Locations/Years	20	0.7510*	0.2324*	3.0187*	153.6831	6.7551
Within Breeds	83	0.2888	0.1150	1.4147	114.9067	3.5875

*P< .05
**P< .01
***P< .001

Fatness is one of our major problems in beef carcass evaluation. Twenty-six recommendations were made to cattle growers and feeders by the National Association of Food Chains to improve and increase sales and consumer acceptance; of these recommendations, fourteen referred to excess fat.

Based on experiences in production and meats studies, the Texas Agricultural Experiment Station has proposed the following characteristics of a Meat Type Steer.

Characteristics of Meat Type Steer

1. Comes from highly fertile parents adapted to production conditions.

2. Weans at not less than 450 pounds at 210 days without supplemental feed.

3. Can utilize a wide range of feeds with emphasis on roughages.

4. Can make 100 pounds of gain as a yearling on not more than 900 pounds of feed, 2 3 concentrates and 1/3 roughage.

5. Can make 1.3 or more pounds of chilled carcass beef per day of age if killed at 12-18 months.

6. Will produce 48% or more of well-muscled loin, rib, and round cuts with at least 2 square inches of eye muscle per hundred weight of chilled carcass. The "retail trimmed" loin, rib, and round should make up at least 38% of the carcass.

7. Will produce beef that is tender and palatable w en marketed and cooked in a normal way.

8. Will be suitable and desirable for slaughter at any time from weaning to 30 months of age under proper management.

INFLUENCE OF TYPE AND BREED ON CERTAIN BEEF PALATABILITY FACTORS

-by-
J. W. Cole and L. Orme

Detailed slaughter, offal, physical, and chemical data were obtained from 63 Angus, Hereford, Brahman, Brahman crosses, Holstein, Jersey and Guernsey steers. These animals were full fed on the same ration from about two to four months of age to approximately 900 lbs. body weight. All other environmental treatments were the same. Data presented at this meeting deals primarily with organoleptic and consumer preference studies.

Significant differences among breeds were observed for tenderness and total palatability as scored both by a trained panel and family panels. These two characteristics were ranked essentially the same by both testing groups (Table 1). Warner-Bratzler shear values ranked the breeds almost in the same order as the organoleptic panels.

Percent of times loin steaks from individual steers in each breed were preferred by family panels (Table 2).

Table 3 shows that when panel tenderness was correlated with Federal grade, the correlation was .20 with Jersey included and .45 with Jersey excluded. The difference between the two correlations when family preference is correlated with Federal grade is even greater. Since standards for grading beef carcasses were based largely from date derived from British breeds, it appears that these standards may be inadequate for all types and kinds of beef carcasses. These data also suggest that there may be factors other than marbling, and fat in general, which influence eating quality (Table 4).

AVERAGE TENDERNESS, JUICINESS FLAVOR, TOTAL PALATABILITY AND SHEAR VALUES FOR LOIN STEAKS BY TEST FAMILIES AND TASTE PANEL

TABLE 1. Average Two Years

	Tender-ness	Rank	Juici-ness	Rank	Flavor	Rank	Palata-bility	Rank	Shear
Jersey (9)[a]									
Family	7.44	1	6.63	1	6.55	2	20.61	1	12.45
Panel	8.43	1	7.62	2	7.34	2	23.38	1	12.45
Angus (12)[a]									
Family	6.70	3	6.51	2	6.71	1	19.92	2	13.39
Panel	7.79	3	7.25	3	7.08	4	22.12	3	13.39
Hereford (10)[a]									
Family	6.71	2	6.45	3	6.52	3	19.68	3	14.92
Panel	7.93	2	7.88	1	7.40	1	23.21	2	14.92
Holstein (12)[a]									
Family	6.63	4	6.20	4	6.41	4	19.24	4	15.70
Panel	7.19	4	7.18	5	7.02	5	21.39	4	15.70
Brahman Cr. (10)[a]									
Family	6.40	5	6.14	5	6.22	5	18.76	5	16.63
Panel	6.96	5	7.23	4	7.16	3	21.35	5	16.63
Brahman (10)[a]									
Family	5.77	6	5.67	6	5.88	6	17.32	6	19.84
Panel	6.24	6	7.14	6	6.58	6	19.96	6	19.84

a Represents number of steers tested.
b Shear scores were computed on the Warner-Bratzler Shear.

TABLE 2

PERCENT PREFERENCE BY TEST FAMILIES FOR LOIN STEAKS FROM INDIVIDUAL STEERS AND YEAR

							Av.	Rank	2-Yr. Rank
Jersey									
1957	70	80	87	77	68		76	1	
1958	60	45	83				62	2	1
Angus									
1957	32	77	53	60	70	30	54	3	
1958	80	52	53	50	47	73	59	3	3
Hereford									
1957	63	40	73	52			57	2	
1958	82	67	61	67	47	75	66	1	2
Holstein									
1957	57	35	67	28	33		44	5	
1958	23	55	97	50	46		54	4	4
Brahman Cr.									
1957	43	43	47	25	70		46	4	
1958	38	45	38	24	30		35	5	5
Brahman									
1957	22	25	0	27	47		24	6	
1958	9	7	30	57	8		22	6	6

The difference among breeds were significant, for family panel preference, even though the within breed variation was large (Table2). The Jersey breed was consistently high in percent preference, whereas the Brahman breed was consistently low.

TABLE 3

SIMPLE CORRELATIONS OF PANEL TENDERNESS AND FAMILY PREFERENCE TO SELECTED PHYSICAL AND CHEMICAL FACTORS[a]

	Includes Jerseys	Excludes Jerseys
Panel Tenderness Correlated With:		
Family Tenderness	.664**	.644**
Federal grade	.201	.445**
Marbling	-.327**	-.421**
Shear	-.716**	-.682**
Family Preference Correlated With:		
Panel Tenderness	.692**	.686**
Family Tenderness	.743**	.693**
Panel Palatability	.730**	.718**
Federal Grade	.174	.434**
Marbling	-.272*	-.406**
Percent Chemical Fat.	.119	.213
Shear	-.644**	-.607**
Specific Gravity	-.255*	-.330**

[a]Computation based on two-year averages.
*Denotes significance at the 5 percent level.
**Denotes significance at the 1 percent level.

TABLE 4
BREED AVERAGE FOR GRADE, MARBLING, SPECIFIC GRAVITY, ETHER EXTRACT AND SHEAR FORCE

	Grade	Marbling	Specific Gravity	Ether Extract	Shear Force
Jersey	5.6	7.8	1.066	19.7	12.4
Angus	11.0	4.8[a/]	1.061	29.6	13.4
Hereford	10.8	5.8	1.065	26.6	14.9
Holstein	6.8	8.7	1.069	20.1	15.7
Brahman Cross	7.8	7.0	1.068	22.3	16.7
Brahman	7.0	8.3	1.068	19.7	18.2

[a/]Subjective marbling scores were based on range 1 to 11, with 1 having the highest degree of marbling.

SOME FACTORS WHICH INFLUENCE THE EATING QUALITY OF BEEF

-by-

T. C. Cartwright

Early in the initial phases of setting up production testing studies at the McGregor Station in the late 40's, the leaders realized the need for carcass evaluations as an integral part of the research. A few years later the Home Economics Department was experimenting with beef quality and the work was tied together so that considerable data are accumulating on individuals of known history. Dr. B. L. Warwick and Dr. R. E. Patterson were the men responsible for getting the coordinated work started. The current interest in this subject is a testimony of their foresight.

The data concerning beef quality in this report were all collected under the exacting direction of Dr. Sylvia Cover of the Home Economics Department.

The objective that interests us, is determining which individuals have "better" beef or which individuals produce progeny with "better" beef. The first steps are to set up criteria and to develop methods of assessment. I should like to report some of the enigmas encountered.

The first involves the use of a panel and what is to be gotten from a panel. Originally, an "hedonic" scale was used which merely recorded the reaction of the judges as to whether the eating sensations were pleasant or unpleasant (or some degree of pleasantness). Such a scale is very unsatisfactory for quantitative comparison especially with physical or chemical tests.

It soon became evident that a "quantitative" scale would be more meaningful. This tends to eliminate personal preference of different "quantities." To some, a rare steak may be very juicy but would rate very poor on an hedonic scale because they were typical Texas and typically Texans do not like rare meat.

A second enigma is fostered by the complex composition and unequal distribution of the composites of a bite of meat - principally by the muscle fiber and connec tive tissue and somewhat by fat. Cooking methods that tender one component may toughen another. Differences in temperature, time, and cooking medium, the principle variables of cooking methods, may differentially affect the different components. For example, one method may toughen muscle fiber and tender connective tissue. In our work, we cook by dry heat (oven-broiling) to two internal temperatures, 61°C. (rare) and 80°C (well-done) and by moist heat (braising) to 85°C (medium-rare) and 100°C plus 25 minutes holding at that temperature (very well done).

A third consideration is the difference in different cuts of meat. Longissimus dorsi in the loin and biceps femoris in the bottom round are used. There is a rather distinct difference in the way these muscle respond to different treatments.

The judges are trained and practiced at 20 or more sessions before scoring meat and the same panel is used throughout each year. They are presented with eight samples (2 cuts x 4 cooking method temperature combinations) to score for the characters listed in Table 1, (slide 1).

Table 1. Adjectives Used in Scoring and Associated Weightings - 1956 Data

Weighting of Adjectives	Adjectives Used in Scoring: Juiciness	Softness	Friability of Muscle Fiber	Tenderness of Residual Connective Tissue
10	Extremely juicy	Extremely soft	Extremely friable	No c.t. felt
9	Very juicy	Very soft	Very friable	Tiny amt. of soft
8				
7	Juicy	Soft	Friable	Small amt. of fairly soft c.t.
6				
5	Neither juicy nor dry	Neither hard nor soft	Moderately friable	Small amt. of firm c.t.
4				
3	Dry	Hard	Slightly friable	Medium amt. of firm c.t.
2				
1	Very dry	Very hard	Very slightly friable	Large amt. of hard c.t.
0	Too dry to swallow	Too hard to chew	Not friable	Residue very hard

This exact listing is already out of date in Dr. Cover's thinking.

Table 2. Ranges for 6 Variables in Loin and Bottom Round Steaks - 1956 Data

Variables	No. of Steaks in Each Group (a)	Ranges: Loin	Ranges: Bottom Round
Weight loss (%)	220	9.0 - 40.3	10.7 - 45.3
Juiciness score	220	1.5 - 10.0	2.0 - 9.8
Softness score	220	2.0 - 9.0	3.5 - 8.5
Friability score	220	1.3 - 9.8	4.0 - 9.8
Connective tissue score	220	5.3 - 10.0	1.5 - 10.0

One steak by each of 4 methods of cooking x 55 animals = 220 steaks.

Note the wide ranges for loin in the first column and for bottom round in the second column. Of the three tenderness components; softness, friability and tenderness of connective tissue; only softness is positively correlated with juiciness. This can be seen in Table 3 (slide 3).

Table 3. Correlation Coefficients for Each Pair of Variables within Loin Steaks and Within Bottom Round Steaks - 1956 Data

Variables	No. of Steaks in Each Group (a)	Correlation Coefficients Loin (L. dorsi)	Bottom Round (B. femoris)
Juiciness score versus:			
Weight loss	220	-.848***	-.896***
Softness score	220	.612***	.593***
Friability score	220	-.210***	-.673***
Connective tissue score	220	-.118 n.s.	-.764***

(a) One steak by each of 4 methods of cooking x 55 animals = 220 steaks.

The values are similar in both longissimus and biceps. But the two muscles behave differently for juiciness versus either friability or tenderness of connective tissue. This suggests basic differences in muscle fibers and connective tissue of the two cuts.

To this group of animal breeders, I think it should suggest caution in evaluating an animal with "one bite of meat." Also, a consideration of these phenomena might be very useful in planning research. For example, in an attempt to relate collagen content of the two different muscles to one score for tenderness, Dr. Cover was baffled because the scores were similar but the collagen content was quite different. With the more definitive scoring system the relationship became clearer. Now Dr. Cover tells me that there are different kinds of collagen in different connective tissue organs and that she is adding a PhD protein chemist to investigate collagen in considerable detail. Perhaps it will be found that differences in inheritance and environment (pre and post mortem) cause differences in the quantities of different collagens.

To get more specific with the subject "Some Factors Which Influence the Eating Quality of Beef" slides 4-7 show carcass grades and ether extract plotted against tenderness of connective tissue for loin and bottom round steaks broiled rare and well-done and braised very well-done. Note that the relationship between connective tissue tenderness and either carcass grade or fatness is not close.

The next four slides, 8-11, show U.S.D.A. carcass grades, separable fat and ether extract plotted against shear force values. The corresponding correlation coefficients are shown in Table 4 (slide 12).

Table 4. Correlation of Shear Force Value of Loin Steaks Broiled Well-Done With U.S.D.A. Carcass Grade and Fatness

Identity of Steers	No. of Steers	U.S.D.A. Carcass Grade	%Separable Fat in 9-10-11 Rib	% Ether Extract of Ribeye, Dry Basis
Santa Gertrudis	77	-.218	-.080	-.247*
Bluebonnet 1954	38	-.252	-.296	-.330*
Bluebonnet 1955	31	.120	.064	-.238
Bluebonnet 1956	57	-.360**	-.299*	-.304*
Bluebonnet 1954,55,56	126	-.226*	-.259**	-.312**

The magnitude of the coefficients, along with the aberrancies noted in the scatter diagrams suggest that neither fatness per se, marbling (as indicated by ether extract), not U.S.D.A. carcass grades account for a large enough fraction of the variability in tenderness to recommend any one of them as an adequate independent criterion of beef "quality."

To date I have felt it best in the inheritance work to use the average shear of the eight paired samples to represent each individual with respect to tenderness. My feeling is that this figure is the best available to represent the almost infinite number of cut-temperature-cooking method combinations to which beef is subjected. As gross as this may seem, it is our ultimate hope to be able to utilize the detailed and more basic data being collected in the laboratory.

The use of hair coat characters to indicate "quality" is an old and continuing practice. In order to test this belief and also to not overlook a possible valuable, simple indicator of beef quality, an objective approach was tried. Fifty-one steers averaging 14 months of age and 896 pounds live weight were slaughtered at the end of a 154-day feed-lot period. The breeding groups and numbers were: Hereford (H), n = 9; Brahman (B), n = 10; HxB (F_1), n = 12; HxF_1, n = 8; and BxF_1, n = 12. Two random hair samples of approximately 0.2 sq. cm. each were pulled from the crops region the day before slaughter. The hairs of each sample were counted, and approximately 10% of the individual hairs from each sample were measured for diameter. The average density of 31,770 hairs was 311.57 per 0.2 sq. cm. and the average diameter of 2,533 hairs was 19.8 microns. The average shear force of 1/2-inch cores from the paired bottom round and loin steaks cooked by the two methods to two states of doneness was 9.55 pounds. The differences among breeds were significant for shear force of meat but not for diameter and density of hair. The within breed partial regression coefficients with shear force as the dependent variable were: 0.03 for shear with diameter independent of density and 0.25 for shear with density independent of diameter. The multiple correlation was 0.27. These low, non-significant values indicate that the variation in hair density and diameter would be of little value in estimating tenderness.

Some leads from limited observations of temperament indicated that differences in the activity of a steer and in the manner to which he responded to excitement or stress may be associated with shear force. Additional, but still limited observations (n = 35), have not substantiated this trend observed earlier. A dual system of scoring (with and without disturbance) has been developed but further refinement is probably needed. It is felt that gross differences in temperament contribute to differences in meat quality and could be demonstrated under proper conditions.

Data collected on six characters from 195 "McGregor" steers over a five-year period were analyzed in order to estimate heritability and the inter-relationship among the characters. Included were 16 breeds or crosses sired by 32 bulls. The steers averaged 428 days of age (range 382 to 492) at slaughter and all received standardized management and treatment from birth through cooking. The characters and averages by breed or cross are given in Table 5.

There were significant differences among the breeds in all of the characters. The samples for each breed or cross were very limited in number and scope and are not suggested as being representative of the various breeds. Also, there were significant differences due to years in all of the characters except rib-eye area and ether extract. Apparently, neither the relative amount of muscling nor the fat deposition within the muscle were affected by year-to-year environmental differences to as great an extent as were the other characters.

Heritability estimates are given in Table 6. The estimates were calculated by the 1/2-sib correlation method on a within breed or cross basis. These values are all within the range of estimates previously reported. The estimate for gain on test is higher than other "better" estimates from our data (.48). The reduction to

.11 for chilled carcass weight per day of age is disappointing but not entirely unexpected since it is influenced by birth weight, weaning gain, post-weaning pre-test gain and dressing percentage. Perhaps an estimate computed from data corrected for age of dam to eliminate and source of environmental variation, would be somewhat higher. The estimate for rib-eye is the highest we have obtained for this character. It is in line with other values reported which are probably overestimates of the parameter for the entire beef cattle population. The estimate for average shear force values probably will not be widely confirmed but it is felt that reasonably high values will prevail.

Correlation coefficients among all of these characters are given in Table 7.

Table 5. Averages for six characters by breed or cross.

Breed or cross	No.	Lbs. daily gain	Lbs./day, chilled carcass	Rib-eye, sq. in. per cwt.	USDA grade	% Ether extract	Lbs. shear force
Hereford (H)	46	2.23	1.07	1.87	Good	10.6	9.0
Brahman (B)	10	1.26	.91	2.03	Stan.	5.6	14.2
Santa G. (SG)	15	1.93	1.15	1.76	Stan. +	6.5	9.8
Holstein*	4	2.57	.98	1.80	Util. +	5.4	8.0
B X H (F_1)	47	2.14	1.22	1.76	Good	7.9	10.0
SG X H	4	2.30	1.20	1.80	Stan. +	6.3	9.9
RP X H	4	2.20	1.10	2.03	Good -	10.3	9.2
H X F_1	8	1.74	1.13	1.85	Good	9.3	11.6
B X F_1	35	1.68	1.15	1.82	Stan. +	6.8	11.6
SG X F_1	7	2.14	1.21	1.82	Good	9.0	8.5
RP X F_1	4	1.93	1.11	1.83	Good -	11.1	9.4
7/8H - 1/8B	4	2.40	1.22	1.79	Good -	8.1	10.0
1/8H - 7/8B	2	2.25	1.21	1.84	Stan.	4.5	15.8
3/4 SG - 1/4H	2	2.40	1.09	1.87	Good -	6.1	11.0
SG X RP	2	2.25	1.32	1.52	Good -	7.2	8.6
B X Jersey	1	1.60	.84	1.97	Util.	7.6	8.9
Total or av.	195	2.02	1.20	1.82	Good -	8.2	10.2

RP - Red Poll
*Weaned considerably younger than the others.

Table 6. Heritability Estimates of the Six Characters

Character	Heritability
Gain on test	.58
Chilled carcass wt. per day	.11
Rib-eye area	.73
U.S.D.A. grade	.15
Ether extract?	.64
Shear force	.59

Table 7. Correlation Coefficients among Six Characters and Age*

Characters	Daily Gain	Chill. car.wt.	Rib-eye area	USDA grade	Ether extract	Shear force	Days Age
Daily gain		1,- 7	-32,-37	44, 48	32, 22	-40,-16	- 7
Chill.car.wt.	1,- 7		12, 19	1,-15	- 5,-13	-19,- 5	-18
Rib-eye area	-32,-37	12, 19		-36,-42	-26,-37	6,- 3	-17
USDA grade	44, 48	1,-15	-31,-42		63, 56	-26,-11	6
Ether extr.	32, 22	- 5,-13	-26,-37	63, 56		-28,-15	0
Shear force	-40,-16	-19,- 5	6,- 3	-26,-11	-28,-15		3

* Expressed as percentages. The first figure is overall and the second is within year and breed except under age all are "withins." Values required for significance are 14 and 18 for the .05 and .01 levels for "overalls" and 17 and 23 for "withins."

Some of these values are perplexing and I feel should be considered with caution. Especially discouraging are the near zero correlation between gain on test and chilled carcass weight per day and the nagative association between rib-eye area and gain on test. Shear force, as reported earlier, is apparently associated with gain on test - especially gain during the months immediately preceding slaughter. Also, the sires gain on test was significantly correlated with the progeny's shears. Carcass grade follows a pattern remarkably similar to that of daily gain. Age was later included as it was thought that it might help explain some of these values, but it apparently only points up the non-linearity of the relationships of rib-eye area and chilled carcass weight with age. Multiple regression added little. The multiple correlations computed were:

Rib-eye (Y), daily gain (X), chilled carcass wt. (X_2), age in day (X_3) and grade (X_4), R = .32.

Chilled carcass wt. (Y), rib-eye area (X), grade (X_2) and ether extract (X_3), R = .18.

Shear force (Y), daily gain (X), chilled carcass wt. (X_2), grade (X_3), ether extract (X_4), R = .16.

The relationships among production, carcass and meat characters are felt to be important, not well (if at all) understood and cryptic. More efficient and thorough analysis of the data and consideration of other information including weaning data and total weight are indicated.

GENETIC INFLUENCES ON CARCASS TRAITS

-by-
E. J. Warwick

The ultimate end of all meat animals is the consumer's table. Any breeding project involving meat animals must necessarily make definite provisions for the evaluation of meat quality. Factors affecting quality of beef carcasses (value of a beef animal from the consumer's standpoint) can be divided roughly into two categories: 1. Those things which affect yield, both of total carcass and of preferred cuts, and 2. Those things which affect the reaction of the consumer to the finished product.

The literature indicates there is definite evidence that heredity is an important factor in the dressing percentage of cattle, the composition of the carcass as evaluated by percentages of fat, bone and lean and in tenderness of beef. It appears doubtful that heredity has much influence on the yield of preferred cuts of beef carcasses. These research findings constitute important milestones in the progress of developing information which will enable geneticists to breed for improved carcass quality. This, however, brings up two other equally important questions: 1. What constitutes a desireable carcass? 2. How to best use carcass information for actual improvement through breeding.

Virtually nothing in carcass research to date offers tangible clues as to how factors, other than finish, can be evaluated in the live animal and related to ultimate carcass quality.

If carcass quality can be determined only from slaughtered animals, then breeding work, leading to the improvement of carcass quality, must be entirely on a progeny test basis. This would put the beef cattle breeder in a much worse position than the dairyman is, since he would have no direct measure of productivity in either sex. The dairyman does have the advantage of being able to measure milk production in his cows and has to rely on progeny test information only so far as the sires are concerned.

With a species reproducing as slowly as beef cattle do, and with the time involved in making suitable progeny tests, progress in selecting for improved carcass traits would be bound to be slow. Further, the high cost of making detailed laboratory examinations of carcasses is such as to make it extremely doubtful that such procedures could be adapted on an industry wide basis at least under present economic conditions.

Therefore, we hope that ways and means of evaluating or estimating potential carcass quality in live animals may be developed so that direct selection may be made for carcass quality without having to depend purely upon progeny test selection. I know that many of you have been fully aware of this problem and that a considerable amount of work is underway along the lines I am thinking about. The use of ultra high frequency sound devices, creatinine excretion, and the dispersion in the body of substances such as antipyrine and deuterium oxide in efforts to estimate either body composition or the thickness of various tissues are some of the things under investigation in this regard. The work reported by Dr. Hiner recently, at the American Institute of Food Technology meeting, on the use of small samples of raw beef in a pressure device to estimate tenderness as well as the various chemical approaches being studied as means of estimating tenderness from small samples give us hope that eventually the use of small biopsy samples may be useful.

For details on research findings covered in this talk the following reference is cited:

Warwick, E. J., Effects of Breeding on Beef Carcass Characteristics. Proc. Reciprocal Meats Conference. June 1958, Chicago, Illinois.